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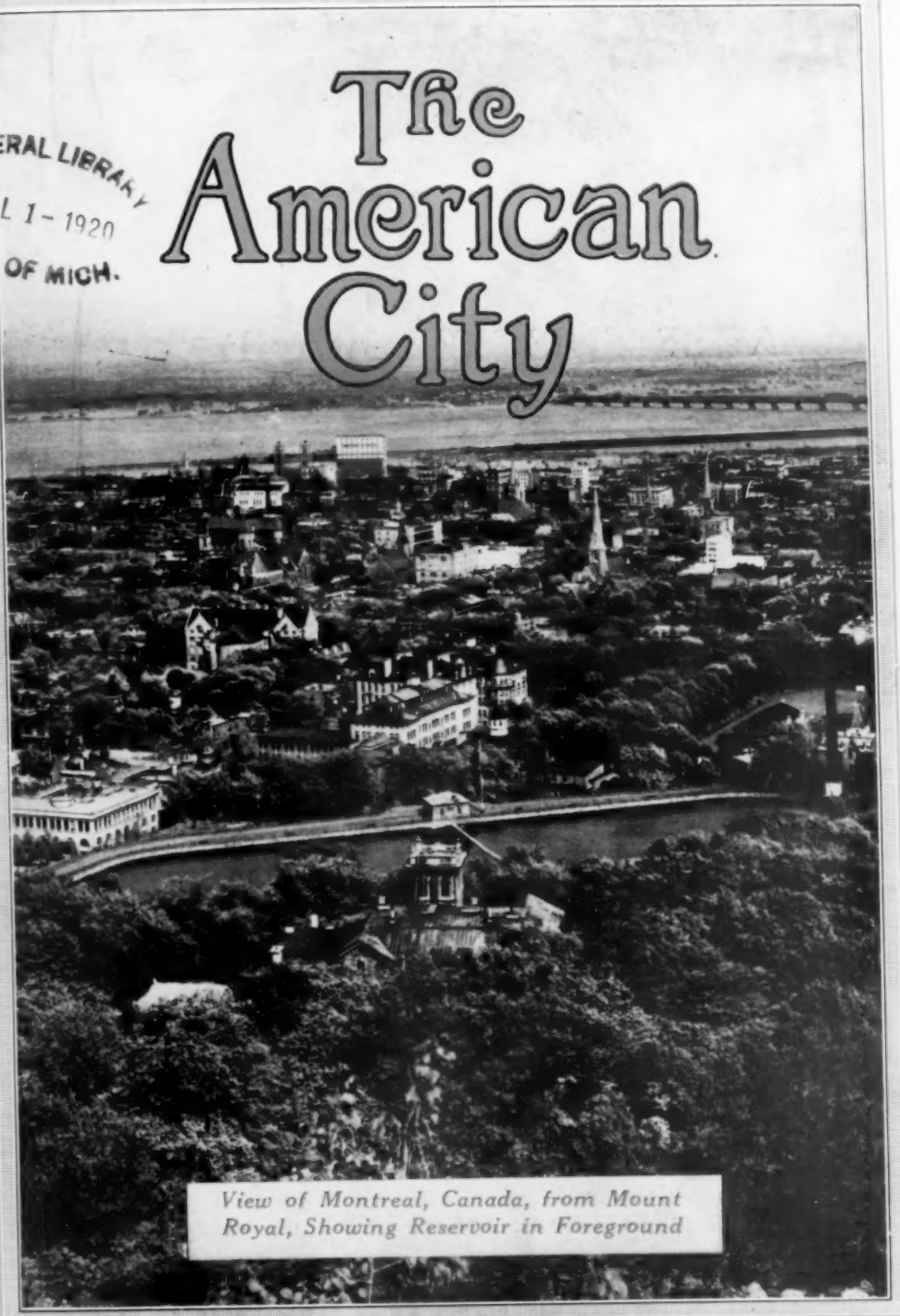
The American City



View of Montreal, Canada, from Mount Royal, Showing Reservoir in Foreground

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The American City

NEW YORK JUNE, 1920

Increasing and Improving a New England Water-Supply

Outline of New Water-Supply for Providence, R. I., Now Under Construction

By Frank E. Winsor

Chief Engineer, Water-Supply Board, Providence, R. I.

THE water-works system of the city of Providence, R. I., now supplies a population of about 300,000 people, which number is increasing at the rate of about 7,000 per annum. Water was first furnished from the present supply in December, 1871. The water is taken from the Pawtuxet River at Pettaconset at an elevation of about 10 feet above tide-water, where it is first pumped from the river to the filter beds, is filtered and is again pumped to the Sockanosset Reservoir, which has a capacity of 55 million gallons at an elevation of about 182 feet above tide-water. From this reservoir it flows by gravity throughout the portions of the city which are lower than about 90 feet above tide-water, and also fills Hope Reservoir, which has a capacity of 25 million gallons and is at an elevation of about 162.5 feet above tide-water. The pumps at Hope Reservoir supply water to the higher por-

BEGINNING THE CONSTRUCTION OF THE MAIN DAM, SCITUATE RESERVOIR
This view taken from the top of the stream control conduit, looking west, shows the concrete blanket, the cut-off walls and the start of the soil core

tions of the city and to Fruit Hill Reservoir, which has a capacity of 25 million gallons and is at an elevation of about 275 feet above tide-water. The high-pressure fire service is supplied from Fruit Hill Reservoir. The city's water-supply is distributed through about 435 miles of pipe lines of various sizes from 6 inches to 42 inches in diameter. The supply was unfiltered until 1905, when slow sand filters with an area of 10 acres were completed and put in service.

The Pawtuxet River at point of intake has a drainage area of about 200 square miles, upon which considerable storage has been developed by the mills for power purposes. Until within the present year the city has had no control over any storage, and in dry times has been entirely dependent upon water released by the mills for their own use in order to make up deficiencies in low stream flow. The present daily consumption is about 21 million gallons, about 15 per cent of which is used in the high-service area. Above the present intake there is a population of over 30,000 people, mostly living in mill villages, with 18 large mills.

Action to Secure New Supply

The ultimate necessity for a new water-supply had been evident to the responsible authorities for many years, and in 1913 a committee of the City Council was appointed to make an investigation. As a result of an exhaustive study by this committee, assisted by eminent engineers, legislation was enacted early in 1915 under which the Water-Supply Board was established with authority to proceed with the design and construction of a new water-supply. The general plan was decided upon and active preliminary work was begun in the summer of 1915.

The main features of the new supply are a large storage reservoir, known as the Scituate Reservoir, on the north branch of the Pawtuxet River, about 10 miles west of the city in the town of Scituate, to be formed by a main dam and dike near Kent, about 2 miles north of the village of Hope, an aqueduct about 7 miles long leading from the main dam to the present distribution system near the Sockanosset Reservoir, a filtration plant near the main dam, and appurtenant works. The necessary real estate and topographic surveys were vigorously prosecuted in 1915 and 1916, and condemnation plans for the area required for the reservoir and appurtenances aggregating 12,450 acres were filed in December, 1916, similar plans for the aqueduct being filed in April, 1917.

Active Construction Begun in 1919

The first construction contract was let in January, 1917, at which time it was expected to proceed promptly with the vigorous prosecution of the entire work. Owing to our country's entrance into the war against Germany, it was deemed both wise and patriotic to defer work not absolutely required by the immediate necessities of the city. Consistent with this policy, no large construction operations were undertaken during the war, and because of the uncertain conditions which have existed in the labor and material markets since the armistice, particularly as affecting long-time contracts, only a limited construction program involving one-season contracts was attempted in 1919. Because of the war the ultimate completion of the work has already been delayed fully two years.

The following are some general statistics of the new water-supply:

SCITUATE RESERVOIR	
Land condemned, acres	12,547
Length of main taking line, miles	56
Cemetery lots within condemned area	171
Bodies to be removed, about	1,800
Buildings on condemned area	1,195
Area of water surface, acres	3,600
Maximum length, miles	7
Maximum width, miles	2½
Length of flow line, excluding islands, miles	38
Number of islands	28
Highway to be rebuilt, miles	25.6
Storage capacity, gallons	37,000,000,000
Available daily for city use, gallons	85,000,000
Present daily use of city, about, gallons	21,000,000
MAIN DAM	
Length, feet	3,200
Maximum height above valley, feet	100
Maximum height above bed rock, feet	180
DIKE	
Length, feet	4,000
Maximum height above ground, feet	38
Average height above ground, feet	15
AQUEDUCT	
Length of tunnel, miles	3.34
Length of masonry in open cut, miles	1.57
Length of pressure pipe, miles	2.09
Total length, miles	7.00

Main Dam and Dike

The main dam and dike will be earth structures. At the main dam an open cut-off trench, from 40 to 60 feet in width at the bottom, will be excavated to rock for the entire length of the dam. A concrete apron about 1 foot in thickness and 30 feet in width with two cut-off walls about 2 feet high near either edge, extending longi-

THE CIRCULAR REGULATING DAM OF THE NEW SCITUATE RESERVOIR OF THE PROVIDENCE WATER-SUPPLY

tudinally the entire length of the cut-off trench, will be built on top of the rock, through which holes will be drilled into the rock, at whatever depth may be deemed necessary, and the rock foundation thoroughly grouted. It is believed that it will not be necessary to excavate any considerable quantity of ledge rock for a foundation for the concrete apron. The trench will then be refilled with selected impervious soil and subsoil, having a maximum thickness of about 80 feet, which material will also be used to form a core extending nearly to the top of the dam, gradually reducing in thickness to about 15 feet at the top. The impervious core will be backed up on each side with local sand and gravel from convenient borrow areas near the dam. The dam at its maximum height of about 100 feet from the bottom of the valley has a thickness at the base of about 650 feet. The up-stream slope will be faced with coarse material in its lower portion and with heavy rip-rap in the portion exposed to wave action, and the down-stream slope will be drained and grassed.

The dam will carry a public highway over its top. The main gate-house will be built within the up-stream slope, with access from the highway. This gate-house will be provided with gates regulating the flow to the city and down the stream, and provision for the probable ultimate installation of turbines for power development will be made. The spillway weir will be located near the west end of the main dam, being separated from it by a knoll of ledge rock, and will be a masonry structure founded for the greater part of its length of about 450 feet on rock. The spillway channel, connecting the spillway with the river, will be excavated through rock for most of its length. The dike is consistent in design with the main dam, the details being dependent upon the depth of water against the structure and the character of the underlying material.

Construction has already been carried on at the main dam, under two relatively small contracts, and has resulted in the completion of the river diversion through a permanent masonry conduit 25 feet wide and 21 feet 4 inches high, founded upon rock. This conduit, over which the dam will be built, provides the foundation of the main gate-house. Up-stream and down-stream cofferdams, between which the excavation of the cut-off trench will be made, have been partially built, and about 500 feet of the cut-off trench west of the river diversion conduit has in part been excavated, concrete blanket constructed, grouted and refilled with impervious material. The highway traffic which formerly crossed the

river immediately above the dam has been diverted over a temporary road and bridge below the dam, and the other work which will materially simplify the prompt and rapid beginning on the construction of the main job when let, has been accomplished.

The contract for the main dam and dike will involve the handling of over 600,000 cubic yards of excavation, the building of nearly 3,000,000 cubic yards of embankment, over 20,000 cubic yards of concrete masonry, about 85,000 cubic yards of stone rip-rap, and other miscellaneous work, and will, it is expected, be advertised for bids as soon as conditions reasonably favorable to the prosecution of such work return. The use of power machinery for excavating and long trains of narrow-gauge power-dump cars for transporting materials is believed to be the best method of building the dam, the topography in the vicinity being particularly well adapted to the economic location of tracks with easy grades and moderate curvature. The reduction of hand labor to a minimum by the substitution of machine methods of construction has been carefully considered both in the design and the specifications for the work. The consolidation of the sand and gravel filling either side of the impervious core by the use of adequate quantities of water may be permitted in lieu of the rolling in layers which will be required in the core itself. The time to be allowed for completing the main dam and dike will be about four years, and the contractor will require equipment sufficient to handle not less than 8,000 cubic yards per working day during a part of this time.

Regulating Dam and Reservoir

In order to provide emergency storage to reinforce the dry-weather flow at the present pumping station whenever needed during the time which will elapse before the new supply is ready for use, a contract for the partial construction of the upper portion of the easterly arm of the Scituate Reservoir, near North Scituate, was entered into in August, 1918, and completed in the following December. A regulating dam, which will, after the completion of the Scituate Reservoir, be used to prevent the exposure of shallow, swampy areas when the main reservoir is drawn down, was built and an area of about 250 acres flooded, thus storing about 430 million gallons. The regulating dam consists of an overfall section of concrete masonry in the form of a segment of a circle, having a diameter of 100 feet with central angle of about 280 degrees, the masonry being about 15 feet high above the natural material upon which it is founded, with wing walls and earth embankments connecting it with the Danielson Pike, which forms a portion of the dam. The masonry overfall is at elevation 284 feet above mean high water, which is the elevation of the flow line of the new Scituate Reservoir. The original surface of the ground outside the circular wall of masonry on the reservoir side was blanketed for a distance of about 75 feet with impervious material to the depth of about 2 feet.

Relocated Highways

Several contracts for highway relocation have been made, and there is already completed or under contract about 10 miles of road out of a total of 25.6 miles of new roads to be built. There will be three masonry highway bridges in addition to a highway crossing of the reservoir near the village of Ashland. The latter will involve an embankment of about 250,000 cubic yards with a large waterway. About one-half of the highways to be built are required to be finished with some form of bituminous macadam or other permanent surfacing.

Cemeteries

The construction of the reservoir necessitates the removal of many bodies from cemeteries within the area affected. Bodies will probably be removed from about 125 lots, the total number to be removed being considerably over 1,300. A new cemetery known as the New Rockland Cemetery has been built, to which over 600 bodies have already been moved.

Aqueduct

The tunnel portion of the aqueduct about 3⅓ miles in length, equivalent, inside the lining, to a circle 7 feet 9 inches in diameter, will, it is expected, be located entirely in rock. There will be a shaft about 2 miles from the west end and about 140 feet in depth. A contract for this work will be advertised shortly after the work for the main dam and dike has been let. The masonry aqueduct in open-cut aggregating about 1½ miles in length and

about 7½ feet in diameter, and the pressure pipe will be placed under contract in time to secure their completion when needed.

Filtration

It has been decided to filter the supply from the beginning of its use, but details of the design have not yet been worked out.

Construction Policy and Organization

Generally speaking, it will be the policy, so far as practicable, to place work under contract in time to secure the harmonious completion of the whole project. The entire project was estimated, in 1915, to cost about $12,000,000, and the construction at present accomplished and under way aggregates about $500,000 in value. During 1920 it is probable that considerable additional work will be begun, the amount of which will depend to a large extent upon the rapidity with which the present conditions of uncertainty as to labor and materials clear up.

The Water-Supply Board is composed of B. Thomas Potter, Chairman; William A. Schofield, Henry A. Grimwood, William P. Vaughn, John Kelso, Joseph H. Gaffner and Walter F. Slade, with Samuel N. Grammont, Secretary. The engineering work is under the direction of the writer as Chief Engineer, with William W. Peabody, Deputy Chief Engineer, in charge also of the Dam and Aqueduct Division; Frank E. Waterman, in charge of the Reservoir Division, and Francis B. Marsh, in charge of the Designing Division.

Another Proof That Metering Saves Money for Municipalities

THE transformation of the water-works of Middletown, Conn., from an unmetered to a fully metered system has furnished a particularly interesting record, which is presented in the 1917 and 1918 reports of the Board of Water Commissioners of that city.

It was determined in 1913 that the existing supply of water was adequate for Middletown for many years to come, provided that it was properly conserved. It appeared that practically all the increase in per capita daily consumption from 90 gallons in 1891 to 133 gallons in 1913 was due to waste. Since the manufacturing services were metered and the manufacturing consumption was estimated as about equal to 25 gallons per capita daily, it seemed evident that 90 gallons per capita daily should be an adequate supply.

The sources of supply were estimated to be able to furnish 2,300,000 gallons per day. By 1913 the city was using practically 2,000,000 per day, and there had been several times in the preceding years when the reservoirs had been nearly empty. It was believed, however, that no additional supply would be needed before 1940, if the water waste was controlled. Metering was decided to be the necessary remedy, and the engineers made recommendation that control meters be installed on the main supply pipe and that as fast as possible the services be metered and waste and leakage stopped by house-to-house inspection.

The Common Council made an appropriation for the purchase of meters, and the Water Commissioners, after considerable war-time delay in securing the venturi meter which they had ordered, installed it on the main supply pipe, meanwhile installing meters on domestic services which had shown the greatest waste. This change was not accomplished without considerable opposition and criticism—a condition which has since given place to apparent satisfaction with the size of water bills. The reduction in the consumption has been enormous, increasing with the number of meters installed. The decrease shown in the following table is estimated by the Water Commissioners to represent a reduction from 133 to 78 gallons per capita daily:

AVERAGE DAILY CONSUMPTION IN MILLION GALLONS

	1916	1917	1918
January	....	1.449	1.321
February	....	1.535	1.624
March	....	1.492	1.624
April	....	1.414	1.349
May	....	1.357	1.332
June	....	1.226	1.331
July	1.614	1.143	1.355
August	1.676	1.475	1.253
September	1.619	1.240	1.226
October	1.688	1.230	1.243
November	1.602	1.195	1.258
December	1.556	1.335	1.249
Average		1.341	1.338

The report of the Commissioners for 1917 states that for November of that year 18 per cent of the consumers were paying more than on the flat-rate basis, 80 per cent were paying less, and 2 percent were paying the same.

A BATTERY OF MACHINES THAT DO MUCH TO KEEP THE STREETS OF MONTREAL IN A CLEANLY CONDITION

Street Sweeping in Montreal, Canada

Pick-up Sweepers Supplant Old Motor Sweepers and Save Money for City

IN 1919 the city of Montreal, through its road department, bought ten auto pick-up sweepers and five small gutter-sweeping machines to replace old motor sweepers, which were transformed into motor trucks for other service.

The quantity of the work done by the new Elgin machines is about the same as that performed by the old sweepers, but the five men who were formerly required to follow up the old sweepers are unnecessary with the new machines. Thus, the saving for a day for a battery of two large machines and one small gutter sweeper is two times five men, times $3.25, equal to $32.50, minus $15.00, or $17.50 per day. Of this amount, $15.00 represents the approximate cost per day of the small gutter sweeper. The saving for the five batteries is accordingly $87.50 per day. A further saving of about 83⅓ per cent is made on the carters employed for hauling sweepings, representing five carters per day at $7.50, or $37.50 per day. Thus, there is a total saving of $120.00 per ten-hour day.

Before the purchase of the new machines, tests were made by R. L. Painchaud, Assistant Engineer in Charge of Roads, at which time he had at his disposal one large and one small machine. The following results were obtained:

On block pavement the area cleaned per hour by both machines averaged 11,000 square yards, the big machine alone covering 9,800 square yards. The filling of the water tank (180 gallons) varied from four to six minutes, and the distance covered with each full tank averaged 6,100 lineal feet; the area covered amounted to 5,400 square yards, and the time taken for emptying the tanks was 38 minutes. Every fourteen minutes the collecting box on the pick-up sweeper had to be dumped. The distance covered in each filling of the box averaged 2,800 lineal feet, and the average area swept was 3,700 square yards.

On asphaltic pavements, the area cleaned per hour by both machines averaged 16,200 square yards, the big machine alone covering 10,500 square yards. The filling time of the water-tank was the same, and the distance covered for each tankful averaged 8,800 lineal feet, the area covered amounting to 7,000 square yards and the time for emptying 39 minutes. Every 37 minutes the collecting box had to be dumped. The distance covered in each filling of the box averaged 9,250 lineal feet, and the sweepings picked up were from an average area of 9,800 square yards.

Difficulty was encountered at first because the chauffeurs were unfamiliar with the machines and naturally some time was required before they were broken in. After the men were fully instructed, however, the number of hours when the machines were in the shop was materially reduced, and little trouble was reported afterward.

The New "White Way" in Maysville, Ky.

Strictly Modern Lighting System Replaces Obsolete Method of Illumination

EARLY this year, Maysville, Ky., completely discarded its old street-lighting system and the mass of overhead wires which were unsightly and dangerous during storm and when it became necessary to combat fires. In a celebration closely resembling the Mardi Gras, the city staged a large parade to inaugurate the new White Way, made up of 64 units with 400 candlepower, high-efficiency lamps placed an average of 90 feet apart. The poles are "Combination" lighting and street railway tubular steel poles 35 feet and 30 feet in height, with ornamental cast iron bases, tops, span-wire bands and brackets manufactured by the Electric Railway Equipment Company of Cincinnati, Ohio. The ornamental bracket is designed for supporting a General Electric Form 9 Novalux fixture with 400-candlepower, 15-ampere series lamps.

THIS STREET, SHOWING THE NEW POLES ERECTED AND THE OLD POLES STILL LITTERED WITH THE NETWORK OF WIRES, IS A SAD CONTRAST TO THE ATTRACTIVE VIEW SHOWN BELOW

THE SAME CORNER AFTER ALL UNNECESSARY WIRING HAD BEEN REMOVED

Of the 64 lights in the White Way, 16 are on an all-night circuit and 48 on a circuit which is shut off at 11:30 P. M. The lamps are placed opposite each other on both sides of the street, averaging about 90 feet apart. The necessary overhead circuits are attached to tubular steel poles with small individual constant-current series transformers at the top of the poles, and secondaries concealed in the poles and brackets.

The entire cost of installation was borne by

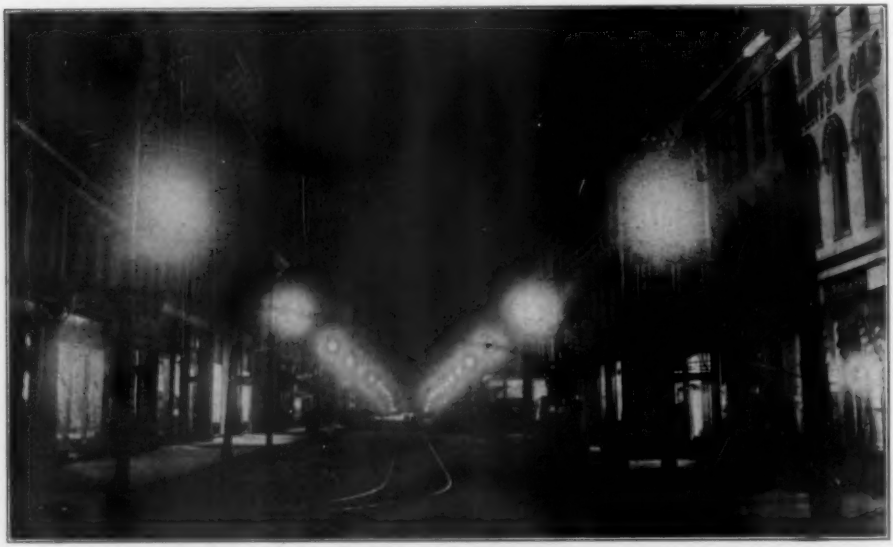
the Maysville Gas Company, the only return being the annual rental. With the increase in number of lamps, the city's bill will be between $2,000 and $2,500 more than under the previous contract, though the price per lamp of all of the 400-candle-power lamps was reduced $5. This new construction replaces the old pole line and distribution installed in 1903 and makes a complete clean-up of the down-town business section.

The main primary feeders were changed to a joint pole line with the C. & O. Railway, with branch mains across town in alleys to large lighting and power transformer banks in the center of each block. All commercial secondaries are thus run into the rear of all buildings in the business section. This enables the city to do away with a mass of wire running along the main street and greatly adds to the attractive appearance of the business district.

On the sides of the tubular steel poles opposite the series circuits are vacant spools on which it is proposed to run electric sign and show window circuits controlled from the power plant, to be switched on and off at the same time as the White Way. It is planned to have a flat current and maintenance rate on signs and windows thus connected, on the basis of watts connected but metered at the plant. This plan is as yet only at the tentative stage.

A very interesting program was instituted for the première of the White Way. City officials, members of the Council, Chamber of Commerce, and Board of Education assembled in carnival costumes at the Boys' Band-Stand, where a ground signal wire run from the plant had been connected to a switch in plain view. The crowds were able to compare the old street lighting, darkness, and the new White Way.

The beautiful white globes of the new system produce a soft, even light entirely devoid of glare. The type of unit is the very latest and is used extensively in larger cities throughout the country. The earlier system used in White Ways consisting of cluster units was thoroughly investigated by the committee, and because it is becoming practically obsolete in modern lighting was turned down for this installation. The new system is strictly utilitarian and not spectacular, the design of the glass canopy being such that practically no light goes skyward, but all the illumination is thrown onto the sidewalk and building fronts.



A NIGHT VIEW OF MAYSVILLE, SHOWING THE NEW WHITE WAY

Electrically Operated Pumping Plants in Indiana

By G. C. Blalock

Instructor in Electrical Engineering, Purdue University, LaFayette, Ind.

EDITORIAL NOTE.—*According to available records there are 206 public water-works systems in the state of Indiana; 76 of these, more than one-third, are operated partially or wholly by electricity. During the past winter and spring 27 of these plants were visited by members of the Engineering Experiment Station staff of Purdue University with a view to ascertaining the present status of electrical operation of such plants. The results of this investigation, with other pertinent data, will appear shortly in the form of a bulletin issued by the Experiment Station.*

THE electrically operated pumping plants in Indiana described and summarized in this article supply water to communities ranging in population from 500 to 25,000 and were found to be operating under a variety of conditions.

Fifteen plants used some form of elevated storage—tank, standpipe or reservoir; six were provided with compression tanks, the pressure being automatically controlled by pressure-gauge relays; the remaining six had no provision for storage, but maintained direct pressure by continuous operation of the pumps. This probably represents in a general way the distribution as to types of plants over the state as a whole.

About 20 per cent of the plants visited made use of deep-well pumps—air lift or displacement. The remainder used surface pumps, though in many cases the pumps were placed in pits from 4 to 15 feet below ground level in order to reduce the suction lift.

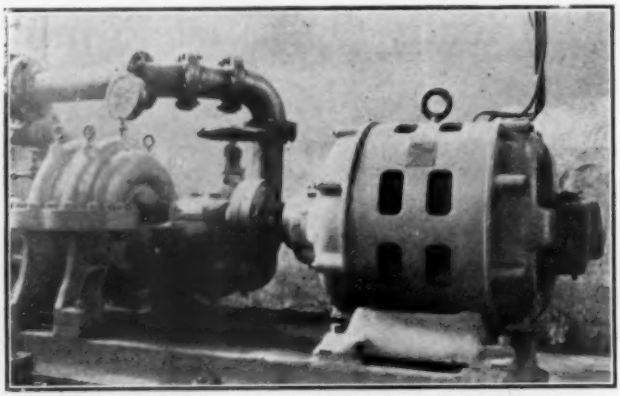
The most commonly encountered source of water-supply was the drilled well, 6 to 10 inches in diameter, and from 100 to 300 feet in depth. In a few cases the supply came from streams or spring-fed reservoirs, but these were rather exceptional. The water from wells appears to be, in general, clear and pure, requiring no outlay for purification equipment. In most localities the water stands from 10 to 20 feet below ground level, but in a few places the water flows to the pump under sufficient head to eliminate entirely the necessity for priming.

Centrifugal pumps and triplex displacement pumps were encountered in about equal numbers, and the plant which contained neither of these types was exceptional. One rotary pump was observed handling the second stage of a two-stage system, and the city of LaFayette has three direct-connected, motor-driven propeller pumps forming the first stage of a two-stage system, the second being handled by steam pumps. These, however, are held for emergency use, the first-stage pumping being normally done by air lift. Also, in one case the first stage was handled by motor-driven deep-well pumps, and the second stage by steam pumps. In 75 per cent of the plants inspected, however, the single-stage system was used.

Alternating current energy was utilized in practically all cases, either because direct current was not available or because the alternating current motor is cheaper, more rugged, and requires less attention. Various types of alternating current motors were found to be in use, however, the choice depending chiefly upon type of pump to be driven. In most cases the available energy supply is 60-cycle, 3-phase current, and the choice lies between the squirrel cage and the wound rotor types of induction motor the former being used for driving centrifugal pumps, where the starting load is light, and the latter for driving displacement pumps, where the starting load is relatively heavy. Exceptions were noted, however, to this general rule, and in one case synchronous motors were found giving very satisfactory services. Single-phase, 25-cycle motors were encountered in one plant, the energy being obtained from an inter-

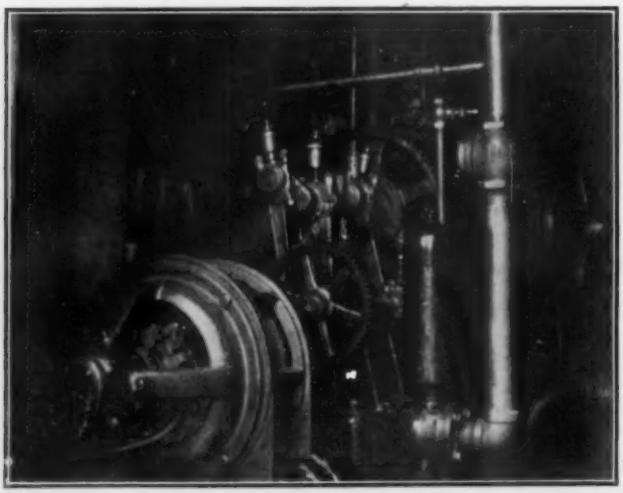
urban railway transmission line which passed through the town.

The pressures in use for domestic service were found to range from 25 to 90 pounds per square inch, the average being about 40 pounds, corresponding to a head of 92 feet. In many cases provision is made for raising this pressure for fire-fighting purposes to 90 or 100 pounds by cutting off the storage and bringing a special high-pressure unit into service. It is not uncommon to find steam pumps used for securing the extra pressure needed for fire service, though the motor-driven fire service pump is popular in localities where auxiliary steam equipment would be expensive to provide and maintain. There appears to be a growing sentiment in favor of securing the extra pressure by using a portable pump at the location of the fire, rather than by boosting the pressure over the whole system, thereby making both mains and plumbing liable to damage or even complete failure at a time when such failure would be most serious. This method also eliminates the extra demand for water at service connections during the high-pressure periods, when the greatest possible supply should be available for fighting fire.



A FIRE SERVICE SET AT NORTH MANCHESTER, IND.
This set consists of a 50-h.p. Westinghouse motor direct-connected to a 520-g. p. m., 2-stage Alberger centrifugal pump

The average pump capacity provided for domestic service appears to be about 200 gallons per minute, per 1,000 population, but this figure is not of very great value, since the capacity required depends very largely upon local conditions and may vary widely for towns of the same population. Also, the system used has considerable influence upon the pump rating. A direct-pressure system must have sufficient capacity to supply the peak of the load, while in a storage system the pump needs to supply only the average demand, anything above this being drawn from the storage. The tendency is to provide too much rather than too little capacity, in order to be on the safe side and to provide for future requirements. The pumping units designed for special fire service average about 250 gallons per minute pump capacity per 1,000 population. These units also provide reserve capacity for abnormal demands other than for



PUMPING UNIT ON A DIRECT PRESSURE SYSTEM AT MOORESVILLE, IND.
Unit consists of a triplex pump direct-connected to a G. E. 7½-h.p. induction motor

fire service.

Reported Conditions

Town officials and operating men expressed themselves almost unanimously as well pleased with the results obtained through use of electrically operated equipment. Appreciation of the greater convenience and decreased operating expenses was especially marked in places where the pumps were previously steam-driven. One plant was visited in which steam operation had been resumed after a trial of electric operation, but no one available at the time could give an adequate reason for the dissatisfaction with the electric drive.

Another case of dissatisfaction was encountered where a direct-connected, motor-driven, centrifugal pump was giving unsatisfactory service, though no blame was placed upon the motor itself. The pump was obviously not designed for the conditions under which it was working, and the result was an energy consumption very greatly out of proportion to the work done. Plans were being made to replace the centrifugal with a triplex pump, though it appears likely that a change in impellers would have accomplished the same result. This serves to emphasize the necessity for using great care in specifying a centrifugal pump for a driven application, in order that its characteristics may be suited to the work it is expected to do.

Numerous cases of minor troubles with the equipment were reported. Of those directly chargeable to electric operation, the only ones of serious import were those due to lack of adequate protective devices between motor and line. Some of these involved no serious consequences, while others involved considerable expense and inconvenience, as well as fire risk. It would appear that the necessity for adequate protection of the motor and control circuits is not generally appreciated. The cost of such protective apparatus is not great and will soon be repaid through decreased repair bills and greater reliability of the equipment. Troubles were reported due to lack of reliable low voltage and no-voltage cutouts, and also to lack of proper protection against lightning. Good lightning arrester equipment properly installed is absolutely essential where power is secured from a transmission line and is the only means of preventing damage, which may vary all the way from a breakdown of insulation in one or more coils to destruction of the entire electrical equipment.

Next to having the apparatus itself, it is of importance that attendants should understand the significance of the protective devices. One plant was visited where no voltage protection was provided, but a former attendant had decided that by wedging the starting handle in the full-on position he could start the pump from the power station and save himself a half-mile walk. Unfortunately the motor windings did not survive the initial experiment, but had to be entirely replaced.

The most frequent source of trouble other than electrical appeared to be due to freezing in severe winter weather. Bursting of pump cylinders was reported in numerous instances. In some cases these breaks had been repaired by welding, in others the cylinder had to be replaced. Troubles from this source can be charged only to neglect in providing some means for keeping the temperature sufficiently high to prevent freezing.

The installation of cheap equipment invariably results in troubles due to excessive wear and breakage; and poor judgment in the selection and use of equipment augments the difficulties along this line. In one plant the first stage was handled by an air lift, and the second by a cheap rotary pump. The latter was driven at such high speed that it handled water faster than the air lift could supply it, so a portion was bypassed and pumped over again. In addition, the wear on the impeller was so great as to necessitate its renewal two or three times each year.

Troubles due to flooding sometimes occur in plants having the pumps located in pits. Unless the motor windings have been thoroughly waterproofed they are sure to be more or less permanently damaged, with consequent shortening of their useful life, although the damage may not be such as to require immediate rewinding.

Improper alignment of pump and motor causes undue wear and results in decreased efficiency and increased maintenance cost. The same cause sometimes results in broken rods in case of deep well pumps.

Corrosion and rapid wear due to sediment in the water being pumped were reported in one or two instances.

The practice of selling water by meter

appears to be rapidly superseding the old flat-rate system. Of more than 13,000 service connections reported, nearly one-third were metered. Four systems were entirely metered, and only two had no meters at all. Many towns are changing over to the meter system as rapidly as circumstances permit, and expect to have all connections metered within a year or two.

Only six of the towns visited had provision for metering the pump discharge, despite the obvious advantage of having this means of checking the performance of the pump and motor. With a watt-hour meter on the input side of the unit, and water meter and pressure gauge on the output side, the duty and over-all efficiency may readily be determined at any time and any marked drop detected and accounted for. A centrifugal pump needs particularly to have its performance checked to avoid the marked drop in efficiency which occurs when the impeller is not properly designed for the conditions under which it is working. The substitution of an impeller of slightly different design may effect a saving which will pay for both meter and impeller within a comparatively short time.

Operating Records

It was found rather difficult to obtain accurate records of plant operation and costs, particularly in the smaller towns. Combined power and pumping plants frequently do not provide separate meters for measuring the energy supplied to the pump motors nor divide the operating costs equitably between the power and pumping departments of the plant. Where energy is obtained from sources not owned or controlled by the interests operating the pumping plant, the meter provided often includes the energy used for street lighting, station lighting and heating, or other purposes, and, as previously mentioned, it is not often that provision is made for measuring and recording the amount of water pumped. The data obtained therefore involve estimates in many cases and should be considered as indicating plant performance in a general way only.

Data for calculating energy consumption per 1,000 gallons of water pumped were obtained for 14 towns. In kilowatt-hours per 1,000 gallons, this energy consumption ranged from a minimum of 0.20 to a maximum of 3.28, giving an average value for the 14 towns of 1.31.

Since there is considerable variation in the total head against which these pumps are working, a better measure of performance may be obtained by reducing the figure given for each plant to a basis of 100 foot total head. This gives values ranging from 0.125 to 1.96, with an average of 0.90 k.w. hr. per 1,000 gallons per 100 foot head.

The operating cost per 1,000 gallons was found to range between 0.88 and 16.83 cents, with an average value of 4.97 cents. Reduced to a basis of 100 foot head, this average becomes 3.74 cents per 1,000 gallons per 100 foot head.

Tests

Two plants equipped with meters for measuring the pump discharge were selected, and tests were run, with two objects in view: first, to determine the duty and over-all efficiency of the pumping unit, thus obtaining a basis for figuring energy costs per unit discharge; and, second, to determine the nature of the power demand and thereby establish the degree of desirability of pumping loads from the central station point of view. The test in each case extended over a period of 24 hours, and in addition to kilowatt-hour and water meters a graphic recording watt meter was used for measuring and recording the power demand.

The unit tested in the first plant consisted of a 2½-inch, single-stage, 175-gallons-per-minute, centrifugal pump, driven by a 15-h.p., squirrel-cage type induction motor, pumping continuously against the direct pressure of the mains. A total pumpage of 11,900 cubic feet was observed—an average rate of 61.8 gallons per minute—against a pressure of 40 pounds per square inch with input of 9.38 h.p., giving an over-all efficiency of 16.7 per cent. Estimates based on pipe friction tables give about 10 feet loss of head in elbows, valves, meter, etc., between the pump intake and the point at which the pressure gauge was attached to the main. Including this loss of head raises the efficiency about 2 per cent. This still gives a very low over-all efficiency, but it should be noted that the pump is discharging but little more than one-third its rated capacity, this resulting in the motor's run-

ning at considerably less than its normal rating. Neither pump nor motor can therefore be expected to show very good efficiency. It is evident that this unit is not operating under the conditions for which it was designed, resulting in high energy consumption per unit output.

The unit tested in the second plant consisted of a 4-inch, 2-stage, 380-gallons-per-minute, centrifugal pump, driven by a 25-h.p., squirrel-cage type induction motor, pumping to mains, with stand-pipe storage, the frequency and duration of pumping period being regulated by a pressure-gauge relay and an automatic motor starter.

Three runs of approximately two hours each, at an average pressure of 55 pounds per square inch, gave a pumping rate of 350 gallons per minute, with an input of 32.25 h.p., showing an over-all efficiency of 38 per cent. Estimated loss in head due to friction amounts, in this case, to about 35 feet, and inclusion of this loss as part of the total head raises the efficiency about 10 per cent. The over-all efficiency in this case checks closely with manufacturers' estimates for this size and type of unit, and the unit is evidently well adapted to its work.

The conclusions arrived at as a result of investigation and study of the present status of electricity in pumping plants of Indiana may be summed up as follows:

1. Where local conditions have been carefully considered and the type and capacity of pump and motor which best suits those conditions intelligently selected, electrically driven pumps have proved highly satisfactory; they have been found to be easily handled, convenient, reliable and economical.

2. While the motor itself is very unlikely to give trouble, and transmission lines have proved quite reliable, yet it appears advisable to provide some auxiliary source of power. The automobile type gasoline engine appears particularly well suited to this purpose.

3. The energy consumption in properly designed plants may be expected to vary from 0.2 to 2.0 kilowatt-hours per 1,000 gallons per 100 foot head, with 1.0 as a fair average.

4. The operating expenses for an electrically operated plant are low, considerably below those for a steam plant and appreciably below those for an internal combustion engine plant.

5. The pumping plant load is a desirable one from the central power station point of view.

A CONVENIENT AND SANITARY TRAVELING MARKET IN WHICH PRODUCE IS PROTECTED FROM FLIES AND DIRT

The Volume of Laboratory Work Necessary to Control a Public Water-Supply

By C. K. Calvert
Chemist, Indianapolis Water Company

THE discussion comes up repeatedly within water-works organizations as to just the amount of stress to be laid upon volume of laboratory examinations of the supply.

Dr. Cobb, before the 1919 meeting of the Indiana Sanitary and Water Supply Association, emphasized the value of the sanitary survey over laboratory work in rating new supplies and in holding established ones up to standard. It is possible for pollution to occur in such small amounts as to be undetectable by the usual laboratory procedures. It is just as possible for even gross pollution to occur in such a manner as to escape the most careful sanitary survey. Regardless of the watchfulness of the personnel, laboratory examinations cannot be eliminated with safety.

What Actually Controls the Volume of Work

The volume of laboratory work is controlled by two opposites: how small an amount will provide safety; and how large an amount can be afforded. Both factors are controlled largely by the size of the organization. No definite amount of money or per cent of total outlay can be established as a minimum requirement, because the elements affecting the character of the raw water and the methods of improvement differ as widely as the cost of construction and operation of individual plants. It seems possible, however, to establish loosely the volume of work required on a basis of the relative value and importance of laboratory tests.

Intensive Work for First Year Essential

Prior to the building of a water-supply system and during its early years, no pains should be spared to determine the character of the water to be used and of other sources available or likely to contaminate it. The information should include chemical and bacteriological data with partiality shown to neither. Over a period of at least a year extensive tests will, in most cases, develop simple tests whereby one water may be distinguished from another and an admixture in any considerable amount be possible of detection. The three tests most often useful in this connection are alkalinity, chlorine and nitrites. When such tests are known, laboratory work may be simplified, making only such determinations as will detect changes in the source of supply. This applies especially to deep-well supplies, which are usually of quite different character from the waters found nearer the surface. By some chemical test a break in the casing admitting near-surface water may be detected before it has developed to the extent of producing a bacterial contamination.

Bacteriological Examination Important

Even in such a simple system it is also desirable to know that the quality is maintained in the distribution system. Perhaps the danger of contamination from industrial plants is as great or greater in the small town than in the city.

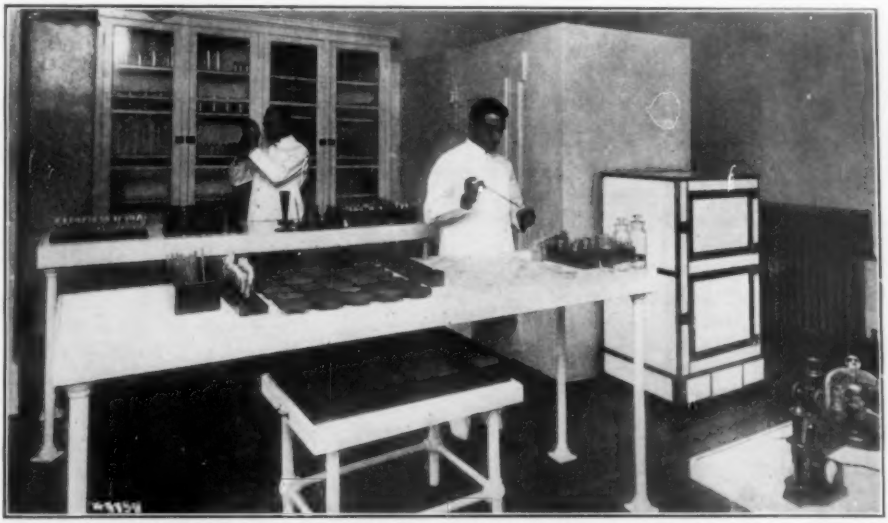
In this sized plant it is not possible to employ a man to devote his entire time to laboratory activities, and it usually falls upon an already over-busy superintendent to obtain his own laboratory information. By using, in taking samples and doing media work, a man whose entire time is not wholly occupied otherwise, he may in an hour a day make bacterial counts and B. coli tests on five or ten samples and make one or two titrations to keep in touch with the general characteristics of the supply.

Most plants of small size drawing acceptable water directly from wells are making no tests whatever, and the supply is tested only at most a few times a year. If occasional contamination is found it is a matter of chance. In every plant, regardless of size or simplicity of operation, daily tests should be made even though they indicate satisfactory water month after month and year after year.

The following tests are recommended as

a minimum of laboratory work for the simplest plant: the count at 37°; the determination of B. coli in suitable amounts; and one or two chemical tests as indicated by a study of the individuality of the water.

The B. coli test should be made on at least 50 cc. of sample. This amount may be examined in one portion, but it is preferable to divide it into two or five parts. The completeness of the B. coli identification is a mooted question. Obviously the most careful work is desirable. However, the presumptive test made on 50 cc. of water gives better information than a more exhaustive identification on a single 10-cc. portion.



THE BACTERIOLOGICAL ROOM OF THE INDIANAPOLIS WATER COMPANY LABORATORY

These tests should be made on a sample of the water as it goes to or leaves the pumps delivering the water to the consumer, and on samples taken at more than one point on the distribution system. These points should be chosen with due regard for the location of possible contamination from industrial plants.

Watch for Aftergrowths in Chlorinated Water

The simplest type of purification is sterilization of the water with some form of chlorine. Only very clear waters, reasonably free from organic matter, are easily treated in this manner. Whatever the type of water, a sample should be examined before and after treatment. In this case, and especially if the water is not clear, the distribution samples are of increased importance on account of aftergrowths which may occur from those organisms enclosed and protected by particles of suspended matter. The samples taken before sterilization must be examined for total count and B. coli in suitable and very much smaller amounts than the well or sterilized water, in order to give accurate information as to the concentration of contamination and the extent of subsequent purification.

Laboratory Work Increases When Plant is Enlarged

Usually an increase in the size of the plant makes it necessary to draw on more polluted sources in order to produce an adequate volume, and this means that greater purification must be provided, involving the use of more complicated physical and chemical procedures.

Chemical Tests Valuable Aid to Proper Coagulation

When coagulation is employed, the laboratory must stand ready to make accurate determinations of the alkalinity and carbon dioxide. It is rarely the case that additional alkalinity is required in coagulating with alum, but when iron is used the re-

action is of more importance. Provision must be made for the estimation of the amount of suspended matter and often its degree of fineness. If the sedimentation basin is large or the raw supply impounded, Sedgwick-Rafter examinations for micro-organisms are desirable during the warmer months in order that proper precautionary measures may be taken as the organisms approach the danger point. In our own plant last year we believe a scourge of Asterionella was avoided through use of information obtained from such examinations.

The Value of Other Chemical Tests

Oxygen dissolved and consumed tests sometimes are advantageous, but usually they cost more in time and trouble than they repay.

In cases where softening of the water is effected, the chemical work required is much increased. Not only must the water be examined more frequently for hardness or excess chemical, but the composition of the material purchased must be known.

On filtered water chemical tests are of slight value. After sterilizing, tests should be made to indicate the presence or absence of residual chemical. The O-tolidin test for free chlorine is simple and suitable under certain circumstances. The potassium iodine-starch test, when used with acetic acid, is more accurate and may be used on all types of potable water.

Where water is used for special industrial purposes, the water-works laboratory should be able to furnish information as to the average chemical composition and to aid the consumer by suggesting methods of treating it if required.

The old-line sanitary standards, based on the chlorine, nitrate, nitrite and ammonia determinations, have long since been shown to be of no value in detecting pollution or rating a water-supply, though the tests are often found prescribed in medical books, etc.

Sanitary Surveys Aid the Laboratory

Not only is it required to know the daily bacterial and B. coli content, but something very definite of the conditions on the watershed feeding the supply. A report of a careful sanitary survey should be at hand with bacteriological findings to indicate the extent of the contamination and its possible effect at the intake.

The Laboratory Checks Operation of Entire Plant

The changes taking place in the precipitation basin are of value not only in connection with algae growths but to indicate the value of each section of the basin.

In mechanical plants the operation of individual filters throughout the day is more erratic than in slow sand plants, and average figures on the combined filter effluent give better information as to the operation of the plant than samples from each unit. However, peculiarities of each unit's performance should be known.

The establishment of the Treasury Standard has placed in the hands of city councils and boards of health a tangible measure of the purity of water which is being applied to all public supplies. It was established for the control of water stored on interstate carriers and has been expressly stated by the authors not to apply to public supplies. Nevertheless it has been ignorantly and maliciously applied indiscriminately, regardless of its fitness for the case at hand. If it could be used as a standard in rating wells, many of our cities would experience a reduction in general intestinal disorders. On account of the existence of the Treasury Standard, however, it is necessary for the laboratory to know whether or not the supply is meeting it, and if not, why, for it is amply evident that the standard can be met in most plants.

In most water laboratories the Standard Methods of the American Public Health Association are followed more or less closely. It is unfortunate that uniform methods are not universal. The fact that they are not followed indicates that present methods are faulty or that no one scheme of examination can meet with approval in the various laboratories.

Though the routine work of a water laboratory may become burdensome and tiring for want of variety, it is always possible to keep on hand some line of new work of interest in connection with operation.

The Cure for Vandalism in City Parks

New York's Experience Shows the Need for Special Park Police

By Joseph P. Hennessy
Park Commissioner, Borough of the Bronx, New York City

THERE is very little protection of park property in the city of New York. As a result, vandalism is often rampant, and an unoccupied park building invites robbery and destruction, as does an unoccupied and ungarded building in any other part of the city. In the parks, trees and shrubbery are maliciously destroyed, benches are upset and broken, iron fencing is smashed, and in summer refuse and litter are conspicuous. Lawns are wantonly destroyed, and if some people had their way altogether, there would be no lawns —only unsightedly and unsanitary surfaces.

In Bronx Borough there is more park area than in all the other boroughs combined, the total acreage being 4,169.11. Parks are a priceless municipal asset, and it is impossible to estimate how valuable the parks of The Bronx may become. Pelham Bay Park, consisting of 1,756 acres, has a large water-front. A part of this park was used by the Navy Department for a naval station during the war. Buildings were erected upon it at a cost of about eleven million dollars. These buildings are now in process of demolition.

Previous to the enactment of the present city charter in 1897 there was a well-equipped park police force, especially trained, and it is an admitted fact that since the amalgamation of this force with the regular police force the parks have suffered more and more for the lack of a force specially appointed and maintained to deal with park problems. Theoretically the regular police force protects the parks now; practically, however, the parks have little protection. This is not due to lack of desire to help, on the part of the ponce, but to the system. In instances where it is necessary to call for special police assistance to meet some particular situation, quick and effective response is generally received, but the parks of The Bronx are not policed except in incidental or casual fashion. The fact is overlooked that some of our parks include paths and roads that constitute to a very large extent highways, yet, with one or two exceptions, no Bronx park has within its limits an exclusive police post.

Other communities have in their public parks a police force responsible to the park authorities. This, in the writer's judgment, is the way it should be; then responsibility would not be divided. The destruction of park property amounts annually to a very large sum. This amount, if saved, would go a long way towards paying the expenses of a park police force, and at the same time would return to regular city duty the few police that are on duty in Central and Prospect Parks.

Some particular instances of wanton destruction and rowdyism may be cited as typical of the present menace to city property and public welfare. Within ten days last summer more than 200 flowering plants were pulled up and thrown on the ground in one section. At a prominent entrance to one park crowds of noisy loafers gathered and annoyed those who wished to enjoy the park. Last summer it cost $100 a day to gather up newspapers, bottles and other

> Only recently a New York high school pupil and a band of younger boys were found taking away a part of some park playground paraphernalia under cover of darkness. Fortunately, they were caught, and their parents were summoned to court and fined $5 each. Their appreciation of the situation may be gathered from the fact that after they had paid the fines they asked to have the playground paraphernalia that was detached and stolen surrendered to them on the theory that they had paid for it.

refuse left on park lawns by old and young, and this will, undoubtedly cost $125 a day during the coming summer.

Some of the city magistrates show a remarkable leniency towards violators of park ordinances. For 106 convictions for various offenses in one month in 1919 the aggregate fines were only $165. In some instances offenders get off scot free because they do not respond to summonses. In speaking of the leniency of some of the magistrates one police officer stated that a certain magistrate would not fine the offender because there were no "Keep Off" signs on the park plot. As a matter of fact, there was a "Park Property" sign on the plot in question—placed there with the idea of eliminating as far as possible the objectionable "Keep Off" sign. In this locality the department was endeavoring to beautify a number of park plots with flowers and plants.

At one time last year the whole stretch of one of our parks was littered from end to end with paper—a distance of about three-quarters of a mile on either side of the main road or highway. It took practically the entire force of park laborers a whole day to pick up this paper. Breaking bottles is a vicious form of rowdyism because it often results in personal injury, and the pieces of glass when thrown on the roadway are a menace to automobiles. In a period of one week more than 1,000 broken bottles were picked up in an area of 10 acres.

A report from a foreman in Bronx Park reads like an index of events in a bad boy's diary—wires cut on backstops and around tennis courts; locks put out of commission; ropes stolen; a manhole stuffed with a beer can so that the ball field was flooded; brick ripped up from the main road and deposited on the ball field; all the park benches turned over every night. Some of the most annoying of these events were acknowledged in notes signed by the "Mystery Club." Last winter in the evenings a park with steep grades was practically monopolized by coasters who used their sleds on paths, stairways, lawns and walks, on the highway, across trolley tracks—in any place where the danger to themselves and to park pedestrians was the greatest. Some evenings there were about 3,000 out with sleds in all parts of this park until nearly midnight. In vain they were requested to go over to the ball field, but this they would not do—apparently because there the sport was too nearly harmless.

The park force is used wherever possible, to repress the misuse of the parks. While some of the men have the power to serve summonses, it is not always practicable to do so, as it takes them away from their regular work, and if done to any large extent would leave the parks absolutely uncared for and unprotected. It is evident that the conditions demand prompt relief.

> For chopping down a tree in Van Cortlandt Park a man was fined one dollar. It takes a long time for a tree to grow, and a dollar fine does not seem commensurate with the offense.

In Other Cities

How do other cities prevent such a situation?

The parks under the jurisdiction of the Essex County Commission, Newark, N. J., have a police force consisting of some 40 men, who get good salaries. Philadelphia also has a substantial park police force, and the Commissioners experience no difficulty in preserving the parks from vandalism and disorder.

The Metropolitan Park Commission in Boston has a large police force. They are furnished with uniforms and equipment at the expense of the Commonwealth. On the other hand, James B. Shea, Chairman of the Park Recreation Department of Boston, not connected with the Metropolitan Park Commission, writes as follows:

"Through political manipulation, the State Legislature had this park force incorporated into the regular police force, which now patrols and attempts to protect the property of the department. The results are very unsatisfactory, as vandalism is rarely punished, and, the police force being independent of park officials, the work which it does is simply perfunctory."

In St. Paul, Minn., the park police are independent of the city police and are directly under the jurisdiction of the park department, with full authority to issue summons or make arrests and prosecute in court.

Lyman O. Newell, Commissioner of Parks, Cleveland, Ohio, writes:

"For years the parks were patrolled by park police in uniform, with full police power. This was satisfactory, but changes were made to comply with the financial condition of the city. I would recommend a force of police, uniformed, with police power, who would constantly be in touch with and under supervision of park officials."

Cincinnati has its own park police. The city of Louisville has what is called a park guard, under captain and sergeant. The men are uniformed in cadet gray. They number from 25 to 30, as circumstances warrant. Milwaukee has about 39 patrolmen and one captain.

In Chicago there is quite a large police force under the direction of the West Chicago Park Commissioners, the South Park Commission, and the Commissioners of Lincoln Park. The parks in West Chicago embrace 800 acres and 25 boulevards, totaling 32 miles. They are policed by 120 men, under direct control of the commissioners. The police force of the South Park Commission is about 200. It controls all the traffic on the boulevards throughout the park district, and handles all permits for the construction of buildings fronting on the boulevards, and the various other operations of those having permits for the use of the boulevards and the parks of the city.

Park Police Bill Introduced in New York

The above gives a fair impression of what other cities are doing for park protection. For years in the city of New York the question of better park protection was taken up from time to time by one park commissioner or another, but nothing in the way of betterment resulted. For the last two years, however, the present park commissioners have been active in seeking to arouse public appreciation of the situation. Legislation, of course, was necessary, but the time appeared not ripe for it, from the point of expediency in one respect or another. The present Park Board has, however, made great progress in having secured Mayor John F. Hylan's consent to the introduction of a bill at Albany, providing for park police, with the understanding also that it would have the approval of Police Commissioner Enright.

The bill was introduced too late at the recent session to secure its passage; but it is the intention to reintroduce it early at the next session, when it will have behind it a force of strong public sentiment that can be created for it by that time through organized effort. Its introduction will mean, incidentally, cleaner and better parks.

WADING POOL IN O'FALLON PARK, ST. LOUIS

Methods of Preventing the Destruction of Asphaltic Pavements by Heavy Motor Trucking

By Monroe L. Patzig
Consulting Engineer, Des Moines, Iowa

FIVE years ago there were but few heavy trucks in general use for commercial purposes. To-day there are more than 953,000 in Iowa alone.

Paved streets no doubt have had a great deal to do with the fast-growing demand for commercial cars, but the effect that this growth has had upon our pavements has been a serious one to those in charge of road and street construction. Bituminous pavement construction that was perfectly satisfactory five years ago may to-day be entirely unfit for present traffic.

Where traffic has been concentrated so as to follow single lines of travel, paths have become worn in concrete, brick, bithulithic and wood block pavements. Asphaltic concrete, sheet asphalt and bitulithic have shown tendencies to push or roll.

An Examination of Pavement Failures

These conditions are not only true in Des Moines but evidences of the same conditions exist in all our large cities. In some of these towns where traffic has for a great many years been congested, with heavy teaming over the hard surfaces of concrete, brick, stone, wood block and bitulithic pavements, the tendency to form ruts or ridges has been apparent. But with the increased use of heavy motor cars the same tendency to rut the hard pavements and to cause rolling or shoving of the soft pavements, has been carried onto many streets that have never before shown such defects.

That this is not caused merely by the general growth of the cities and the shifting of traffic to certain streets, can be demonstrated by some streets in Des Moines and a thoughtful analysis of what takes place on the pavement when horse-drawn or motor-drawn vehicles pass over it.

Examples of damaged brick, concrete and bitulithic pavement have been noted in Des Moines, particularly where there have been narrow roadways upon which hauling was confined to a single line of traffic, the disintegration being caused mainly by the pounding effect of the traffic. There are a number of examples also of sheet asphalt pavements that have pushed or rolled under the tractive force of motor vehicles. It was the disintegration of this type of pavement to which the writer's attention was first forcibly turned. At no time before the heavy motor truck age were these difficulties experienced.

THIS THREE-YEAR-OLD BITULITHIC PAVEMENT HAD A MIXED-METHOD SEAL COAT WHEN CONSTRUCTED, BUT DEVELOPED THE DEPRESSIONS SHOWN, WHICH WERE CURED AS DESCRIBED IN THE TEXT

The particular pavement which was first noted had been carefully constructed under a most rigid inspection. It was considered an ideal piece of work when completed, but within two years many exasperating waves

and depressions developed and repairs were necessarily made. Upon making these repairs it was determined that the paving material had bunched up and actually moved along over the base. The movement thereof had actually polished the concrete foundation. While this may be partly due to the construction which was specified for this piece of work, it is believed that the changed traffic had much to do with it.

At the same time that the public was irritated by the conditions on this street, similar defects appeared on Mulberry Street, although the pavement was then about five years old and had been in perfect condition until that time. Other streets showed movement of the wearing surface to a marked degree at about the same time, but all of them along routes taken by the heaviest motor-drawn vehicles. A careful consideration of this matter has also revealed the same circumstances and results in practically all of the larger cities.

What Has Caused These Failures?

The cause seems very simple and clear. Where formerly the heaviest loads rarely exceeded 3 or 4 tons, at the present time the pavements carry loads up to 12 and 15 tons. While the load is considerably increased, the action upon the pavement is a great many times more severe, because of the rebounding action of the springs, which causes an impact or hammerlike blow. There is a succession of these blows upon hitting a depression or other obstacle in the roadway. The speed of the car also intensifies the blows.

For the sake of showing this more clearly, let us assume two large balls of equal size, one weighing 1 ton and the other weighing 4 tons. The small one will represent the weight upon one wheel of a heavily laden coal wagon, while the other will represent the load on one wheel of a 16-ton truck loaded to its capacity. Imagine these two balls rolling over a smooth surface until we come to a depression. Here the balls drop down into the depression and deliver a hammerlike blow on the bottom. If the depression is slight, the impact will be thrust upon the opposite side with a tendency to enlarge the size of it. In the case of both balls traveling at the same speed, you will readily see that the impact of the larger is about four times that of the smaller. If the larger ball travels faster than the small one, the difference in impact will be still greater. Now if the ball exerts its pressure on the surface through the action of springs, this impact will set up a series of these blows which are directed along the line of travel.

The Remedy

The surface may be made to resist these impacts if constructed of tougher and harder materials. It is possible to make the surface so hard that it becomes brittle and will not resist the impact, hence the specification of toughness.

If a pavement is too soft to resist the strain, there is a tendency to push the surface either forward or back when brakes are suddenly applied or the turning power is suddenly applied to the wheels. By examining surfaces at certain street intersections it will be found that this has actually occurred.

Bituminous pavements, and especially those using the smaller sizes of mineral aggregates, are ideal for paving purposes, for the reason that they can be made hard and tough or brittle.

Since the cause has now been determined, it is a comparatively simple matter to construct bituminous pavements so as to resist the demands of traffic. Many streets have since been laid in accordance with this theory and are proving entirely successful, whereas if they had been laid in the same manner ten years ago the practice would have been condemned.

For those who are not familiar with the construction and proportions of bituminous pavements, the writer hopes to drive away the fear that may have existed upon seeing the bad effects during the past five years. Where competent supervision of such construction exists, no better type of pavement can be had. The matter is now well under control, and better results can be secured with bituminous pavements than with many other materials.

The entire situation is one that could not have been foreseen. Trucks are being used more and more to-day, and more disastrous results can be looked for on brittle road surfaces.

Where it was formerly desirable to use 65 to 75 penetration as the proper consis-

tency for asphaltic cements, in order to prevent cracking of the surface, penetrations of 50 to 65 are now found successful to combat the heavy truck traffic of to-day.

It is necessary to guard more closely the grading of the mineral aggregate so as to prevent the use of mixtures that will be apt to creep. A mixture containing too large a percentage of dust or fine material will be apt to shove or creep, and too high a per cent of larger aggregate will not have sufficient stability to resist the tendency to push it out of place.

It has also been found necessary to use a mixture similar to the wearing surface of a sheet asphalt pavement to cover the coarser asphaltic concrete or bitulithic pavements. Without this covering, winter traffic has proved severe on this type of construction, and the mixture breaks up or disintegrates very rapidly. To prevent this unravelling from continuing, it is necessary to cover the surface with another seal coat or mixture, as just described. As long as the coarse aggregate is exposed to the weather and to traffic, it is certain to occur again if the traffic conditions are not greatly decreased.

Sheet Asphalt Pavement Successfully Withstands Unusual Traffic

During the month of February, 1920, 116,000 barrels of Portland cement and during the month of March, 1920, about 180 truck loads of cement per day were hauled between Buffington, Ind., and the city of Chicago. Some of the trucks were loaded with 300 sacks weighing about 16½ tons, this being in addition to the weight of the truck. The Buffington plant from which this material was hauled is two miles from Indiana Harbor. This entire traffic, in addition to very heavy normal traffic, is carried through the city of Whiting on a sheet asphalt pavement constructed during 1918. Inasmuch as this pavement shows no signs of being affected by unusual traffic, the important features of design will be of interest to highway engineers. The base for the sheet asphalt surface is Portland cement concrete 8 inches in thickness. The binder course was laid 1½ inches in thickness and contained approximately 6 per cent bitumen, 25 per cent sand and 69 per cent broken stone passing a 1-inch screen. The wearing course is 2 inches in thickness and was mixed approximately with 11 per cent bitumen, 13 per cent carbonate of lime passing a 200-mesh sieve, and 76 per cent sand. Petroleum asphalt cement used had a penetration of 52 to 55. The roadway averages 30 feet in width and has a crown of 3 to 4 inches. The theory of the construction of this road was to secure a pavement having sufficient weight per square yard to take up any vibration that would be caused by the heaviest load passing at the usual high rate of speed of a heavy motor truck. Such weight is approximately 1,220 pounds per square yard.

THIS IS THE TYPE OF TRAFFIC THAT THE BUFFINGTON-CHICAGO ROAD CARRIED WITHOUT SHOWING SIGNS OF WEAR

The Fields of the Air-Lift and the Deep-Well Pump

By Jacob L. Crane, Jr.
Gannett, Seelye & Fleming, Engineers, Harrisburg, Pa.

STRENUOUS competition exists between the air-lift system and the deep-well pump for drawing water from deep wells, although in reality they are seldom actual competitors, for each has its own specific field with little overlapping. These two methods of pumping have developed simultaneously and it is not unusual to see either one in operation where the other legitimately belongs. In some parts of the country one seems to be in the ascendency, while the other is more common in neighboring territory, but often the selection between them seems to be based on very few sound data. The cost of installation is many times on a par, so there is little advantage here. For each there are at least half a dozen manufacturers and many more sales agents covering the entire field of deep-well pumping as thoroughly as they can, often without concern as to whether they are selling the best article for a particular job. As a matter of fact, the merits and character of each place it at the head of the list for a certain limited field of operation.

The outstanding advantage of the deep-well pump, as compared to the air-lift, is its economy of operation. The overall efficiency of air-lift varies from 10 per cent to 35 per cent, while that of the deep-well pump ranges from 50 to 65 per cent. In other words, it costs to operate a deep-well pump only from one-fifth to one-half of the cost to pump by air-lift. This is a controlling factor in most cases, and for installation where the deep-well pump is truly practicable, and particularly where there are but one or two wells to pump, the deep-well type has the critical advantage and should ordinarily be used. The former disadvantage in the fact that deep-well pumps necessitated more frequent and troublesome repairs has been partly overcome by the advance in design and installation methods, and should not rule out the deep-well pump except in some particular cases.

On the other hand, there is a large group of more or less special well-pumping problems where the air-lift, in spite of its greater operation cost, has an advantage over the deep-well pump and where it finds its legitimate and exclusive field.

Where there are several wells fairly close together they may be operated by air-lifts all supplied with air from one station, thus necessitating only one main pumping plant and building and one receiving basin, and only air- and water-lines running to and from the individual wells. This usually means a secondary high-lift pumping, but even then the installation, and perhaps the operation cost, may be in favor of air-lift, and the satisfaction in operation may be greater.

When a well is so small that a deep-well working barrel large enough for the desired amount of water cannot be put down, the air-lift comes into its own, for the simple matter of an air-pipe and a water-pipe down a well usually makes it possible to pump out of a well by air-lift any amount the well will supply.

When the water is deep in a crooked well it is impossible to operate a deep-well pump, while air-lift apparatus can be used with entire success. By the recently developed booster or multiple-lift system, water can be raised in large amounts from great depths, where deep-well pumps would be out of the question.

When the water contains iron or other objectionable substance, removable by aeration, the air-lift is advantageous because it aerates the water as it is raised from the well and prepares it for settling, or filtration.

These specific cases, and variations of them, outline the field where air-lift pumping belongs, often to the exclusion of other types. As a general proposition, because of its economy, the deep-well pump is the proper choice for most other deep-well pumping problems, wherever they can be readily used.

Savings Through Water-Waste Control

By H. M. Beardsley
General Manager, Water Board, Elmira, N. Y.

THE majority of water-works men are beyond the stage of argument as to the value of meters. It must be pretty nearly universally conceded now that a water-works plant that is not metered is not what it should be and is placing a burden on the community in which it is located by excessive plant requirements, and a burden on the other industries of the country by burning up coal for pumping wasted water which ought to be saved and used for producing useful power.

Altho the question of the advisability of metering water-supplies to control waste may be considered settled in the affirmative, there is always more or less interest attached to concrete statements of what has been accomplished by metering.

When the city of Elmira, N. Y., bought the water-works plant May 1, 1915, there were in use 4,441 meters on 8,782 services, so that the plant was almost exactly 50 per cent metered. The population supplied at that time was estimated to be 42,000. The pumpage for the month was 135,030,000 gallons. Of this, 30,373,000 gallons went to railroads and large industrial plants, leaving 104,657,000 gallons for the every-day use of the city at large. This was equivalent to 80 gallons per capita per day.

The Savings Effected by Complete Metering

It was immediately determined that the remainder of the city should be metered. As is usual, a number of more or less interesting incidents developed in the course of the efforts to get everybody metered. One of the most striking cases was that of a small sporting goods dealer whose store backed up to the Chemung River. He had a single faucet in his store, for which he was paying the regular flat-rate charge of $6 per year. When it came to metering this particular place, it was discovered that the man had a small pond in the cellar of his store, running off into the river, that he kept a large supply of live bait in the pond and a stream of water running continually. This man was using approximately $100 worth of water per year. Needless to say, he did not continue to use this amount of water after the meter was installed, and his meter bills never equalled the minimum allowance of 500 cubic feet per quarter.

In May, 1919, there were 9,876 services and 10,091 meters in use, when the estimated population served was 50,000. The pumpage for that month was 136,377,000 gallons. The industrial plants used 35,000,000 gallons, leaving 101,377,000 gallons or 65 gallons per capita.

The cost for pumping and filtration at Elmira for the year ending May 1, 1919, was $19.60 per million gallons, and the total cost for pumping, filtration, distribution and general expense was $37.90 per million gallons.

The total cost for installing 5,875 meters, from May 1, 1915, to May 1, 1919, was $50,848.12. It will therefore be noted that a substantial percentage on the investment was made by the reduction in consumption of 15 gallons per capita per day.

Results of Pitometer Survey

This, however, does not tell all the story about the control of wastes in Elmira. After more than a year of negotiations with the Pitometer Company, it was decided to have a leakage survey made, which included a test of the large industrial meters in place. The officials were pretty well satisfied with the domestic consumption of 65 gallons per capita, and did not expect to have anything show up except perhaps some little discrepancies in the large meters. Much to their surprise, several good-sized leaks were discovered in the mains and quite a number of small leaks, also one of the large industrial meters was found to be 20 per cent slow. The losses from the largest two leaks were 100,000 gallons per day each.

Savings Through Survey

As a result of the repairs made after the survey, the pumpage for November, 1919, was only 120,329,000 gallons, or 16,000,000 gallons less than it was for May, and after deducting the 43,610,000 gallons used industrially, the per capita consumption was only 51 gallons per day.

As stated above, the cost of completing the metering of the city was $50,848.12. Assuming that the 4,441 meters already installed when the city purchased the plant were put in at the same rate, we have a total cost of $89,301.92 for the entire metering of the city. The saving in consumption of water as between May, 1915, at 80 gallons per capita and the consumption of November, 1919, at 51 gallons per capita at the pumping cost of $19.60 per million gallons, is $10,231 per year, or practically 11 per cent of the cost of metering and the cost of the Pitometer survey. This does not take into account the value of any saving brought about by the installation of the 4,400 meters put in before the city acquired the plant. This saving should rightfully be considered, and would bring the saving in cost of operation up to at least $20,000 per year, or enough to pay for the entire meter installation in four and a half years.

Besides saving in cost of operation, there is also a well-known saving in cost of plant. In many places the installation of meters has reduced the consumption of water so much that pumps which had reached their capacity, and would have had to be replaced, could be kept going and the life of the installation consequently prolonged. Furthermore, it seems reasonable to think that a pump which is good for twenty years, pumping 5,000,000 gallons a day, should be good for twenty-four years if it has to pump only 4,000,000 gallons per day. Furthermore, it is felt in Elmira that there is increased safety in the fact that the 7½-million-gallon pumps now have to run only 12.8 hours per day to produce the 4,000,000 gallons now used, whereas they formerly had to operate 16 hours per day to produce 5,000,000 gallons in 24 hours. This gives an additional shutdown every day of 3.2 hours, giving that much more time to make repairs on the pump and keep it in prime operating condition. The department also contributes something to the common good by the reduction in pumping hours. The plant is operated chiefly by electric power purchased from a power company, and on a 12½-hour pumping schedule it can be operated from 9 P. M. to 6 A. M., and then a few hours after 9 A. M., and thus aid the power company considerably by keeping off the peak load and giving a load to fill up the valleys and improve the load factor.

ACKNOWLEDGMENT.—From a paper read at a meeting of the New York Section of the American Water Works Association.

List of Municipally Owned Asphalt Plants in the United States and Canada

Atlanta, Ga.

Bayonne, N. J.
Bluffton, Ind.
Boise, Idaho.
Buenos Aires, Argentine.

Camden, N. J.
Charlottetown, P. E. I.
Chatham, Ont.
Chicago, Ill.
Chicago, Ill., Lincoln Park.
Cincinnati, Ohio.
Cleveland, Ohio.
Columbus, Ohio.

Dayton, Ohio.
Denver, Colo.
Detroit, Mich.
Duluth, Minn.

Elmira, N. Y.
Erie, Pa.

Fall River, Mass.
Fayette County, Ky.
Flint, Mich.
Fort Wayne, Ind.
Fort Worth, Texas.
Hamilton, Ont.
Harrisburg, Pa.
Honolulu, Hawaiian Islands.

Indianapolis, Ind.

Kansas City, Mo.
Kingston, Ont.

Lansing, Mich.
Lima, Peru.
Lincoln Park Comm., Chicago.
Little Rock, Ark.
London, Ont.
Los Angeles, Cal.

Manchester, N. H.
Memphis, Tenn.
Milwaukee, Wis.
Montreal, Quebec (4 plants).
Munro City, Ky.
Munroe County, Mich.

Nashville, Tenn.
Newark, N. J.
New Bedford, Mass.
New Orleans, La.
New York City, Bronx.
New York City, Brooklyn.
New York City, Manhattan.
New York City, Queens.
Niagara Falls, N. Y.
Norfolk, Va.
Northampton, Mass.

Oklahoma City, Okla.
Omaha, Neb.
Ottawa, Ont.

Pawtucket, R. I.
Pittsburgh, Pa.
Portland, Ore.
Portsmouth, Va.

Reading, Pa.

St. Louis, Mo.
St. Paul, Minn.
Saginaw, Mich.
San Francisco, Calif.
Schenectady, N. Y.
Scranton, Pa.
Seattle, Wash.
Sherbrooke, Quebec.
Shreveport, La.
Spokane, Wash.
Springfield, Mass.
Superior, Wis.
Syracuse, N. Y.

Toledo, Ohio.
Topeka, Kan.
Toronto, Ont.
Trenton, N. J.

Victoria, British Columbia.

Washington, D. C.
Wilmington, Del.
Winnipeg, Man.
Worcester, Mass.

Youngstown, Ohio.

The United States Government also has 12 asphalt plants scattered throughout the country.

The All-Year School

"The Greatest Americanization Agency Yet Established"

By David B. Corson
Superintendent of Schools, Newark, N. J.

IN 1885 the Board of Education of Newark established summer schools, the first in the United States. The purpose was to keep the children off the streets and to furnish them interesting and profitable occupation. These schools have developed into one-session "coaching" or "promotion" schools wherein pupils may strengthen their work and take advanced work to gain grades. A second step of equal importance was taken in 1912 when the experiment of having two all-year schools, one located in the Hebrew section of the city and the other in the Italian section, was authorized. At the end of June, 1918, the number had been increased to seven, two of which were special schools. Three more, including a junior high school, were organized on the all-year plan in September, 1919.

> There is complete agreement among teachers in all-year schools that when school opens in the fall there is very much less time consumed in the all-year schools in getting to work, because of the fact that the pupils have not had a long vacation. The pupils who have attended in the summer term have had only a short interruption in the habit-forming work of the school. Habits of cleanliness, punctuality, industry, restraint, etc., are not broken in two weeks as they usually are in two months. The process of forming these habits has been continuous, and there is less or even no waste. The difference in the same school between the pupils who attend in the summer time and those who stay at home is noticeable when the children return in September.

All-Year Schools in Newark, N J.

The eight grammar schools now operated as all-year schools are divided into two distinct types—three of the regular all-year type, and five (including the junior high school) of the all-year alternating type.

The oldest of the all-year schools is of the regular type. It is located in the heart of a congested section of the city. The school has a day of five and a quarter hours. Manual training is taught one double period a week, sewing one, and cooking one, drawing an hour a week, and music ten or twelve minutes a day. For lack of time, science is given scant attention. To the casual observer this school appears to be a good school of the usual kind. It differs in that it does forty-eight weeks of work every year, graduates four classes, and is reorganized four times.

The second type is the all-year-alternating school, the oldest of which was organized on this plan a little more than four years ago. In this type of school the day begins at 8:30 and closes at 3:40, with an average period of about an hour for luncheon. The day for pupils is therefore about six hours. This type of school is divided into an "X" and a "Y" school to provide for the alternation in the use of rooms and equipment.

The all-year-alternating schools have manual training and printing shops, sewing, cooking, drawing, music and science rooms, gymnasiums and playrooms,—two or more in a building,—auditoriums, gardens, and one a cobbling shop. Science is a special activity and is very successfully taught. In these schools all the manual subjects have a double period a day in cycles of twelve weeks each. The educational opportunity is thus immensely increased and a greater degree of skill is acquired by the pupils in all the manual arts taught. The auditoriums in alternating schools are in almost constant use for singing, for dramatization, for illustrated lectures, for phonographic concerts, for moving picture exhibitions. One possibility of these schools is of unusual value: the produce raised in the garden of one school, eleven city lots 25 by 100 feet each, has been canned by the girls in the domestic science room, and the food used in the ungraded schools where food is provided for pupils. Schools of this

type add to the advantages of the regular all-year plan great flexibility in the school organization and enrichment of the curriculum by play, auditorium features, and the special activities of laboratory, shop and studio, providing the children with instruction in manual and other arts that is really worth while.

The curriculum of each grade in these schools is divided into three sections of twelve weeks each, instead of two sections of twenty weeks each, as in the regular schools. The work done, however, in nine months is not exactly equivalent to that done in the regular school in ten months. The curriculum has been somewhat simplified by the elimination of material not really essential. The terms begin September 1, December 1, March 1, and June 1. There are forty-eight weeks of work, with a week's vacation at Christmas, one at Easter, and two at the end of August.

The establishment of an all-year high school was effected on December 1, 1919. The Central High School was selected because it had an enrollment of 2,025 pupils. The number of pupils indicated that the school could afford the acceleration which the plan provided.

The plan embodies these features:

(a) The work formerly done in 38 or 40 weeks in any subject of study is now done in 36 weeks. The less important topics are eliminated from the subject matter, and less time is taken for tests and examinations.

(b) There are four 12-week terms a year and 4 weeks of vacation.

(c) Instead of dividing the course of study into two parts—B and A—there are three parts—C, B, and A.

Trial only can determine whether pupils who do not desire to attend the summer term will drop out June 1. In the elementary all-year schools those who do not wish to attend stay until the end of June and then drop out, making the consolidation of classes necessary. Many pupils are anxious to gain time, and it is believed that 70 to 80 per cent of the high school enrollment will attend throughout the summer. If a pupil drops out at the end of June, all the work of June must be repeated in September. It may be that this natural penalty will cause pupils to remain through July and August in large numbers.

The all-year plan provides a way whereby ambitious pupils may save time in getting an education. By continuous attendance for three years a pupil may finish a four-year course. The speed of the work ought not to be greater than the pupil's ability to assimilate knowledge or more rapid than his mental development. If anyone finds the rate too rapid, the plan is flexible enough to permit him to omit some terms and still gain time. The school continues, although the individual may not attend every term consecutively. The opportunity is his, if all personal conditions are favorable.

The real purposes in the establishment of all-year schools are educational rather than economic.

The Effect on Energy

The first objective is to reduce the waste in energy incidental to the long break of the school year in July and August. It is well known to all teachers that much time is used—two or three weeks—in January, and again in June, in preparation for the final term examination, which consumes an additional week of each of these months. It is evident that the short term removes the necessity for using so much time for a grand final review and drill. The theory is that frequent and reasonable reviews and drills should be substituted for the very formal one hitherto used, and that the educational process should be continuous.

There is complete agreement among teachers in all-year schools that when school opens in the fall there is very much less time consumed in the all-year schools in getting to work, because of the fact that the pupils have not had a long vacation. The pupils who have attended in the summer term have had only a short interruption in the habit-forming work of the school. Habits of cleanliness, punctuality, industry, restraint, etc., are not broken in two weeks as they usually are in two months. The difference in the same school between the pupils who attend in the summer time and those who stay at home is noticeable when the children return in September.

The Effect on Health

The second objective of the all-year schools is to prove that school work in summer is not injurious to health. The health of children and teachers in these schools

has been uniformly good. The Department of Medical Inspection is vigilant and the school nurses are watchful and thoroughly efficient. The physicians in charge of these schools report that in their opinion "the general health of the pupils has been better than if the children had not attended school." The percentage of attendance on the enrollment in the schools is generally higher in the summer than in other schools during the year.

Inquiry in the home reveals the fact that parents believe the children are better off in the large, cool, pleasant classrooms than in the streets or even at home. Pupils about whose physical fitness there is any doubt are not admitted. In several summers there have been very few pupils whom teachers thought might better have stayed at home.

To answer the question as to the effect on teachers: Referring to the oldest school as typical, there were fifty teachers in the school when the plan was adopted. Seven have been transferred to other schools, five have been promoted to higher positions in other schools, two have gone to other cities, sixteen have married, and twenty are still in the school. Of these, fifteen have taught from three to eight successive summers out of the eight since the school was made an all-year school. Of the sixteen teachers who resigned to be married, twelve taught from three to six successive summers without injury to their health.

Attendance of pupils and service of teachers in the summer are voluntary. If teachers in a school do not care to teach there are always a number of experienced teachers of given grades from other schools who gladly accept the positions. The testimony of the teachers almost without exception is that there are no detrimental effects upon their health. They say that it has not been impaired by extra work. Some say they return to school in September somewhat lacking in the buoyancy and freshness characteristic of those who have had two or three months' vacation. Others say they prefer to teach in the summer not only because of the extra salary but because the long vacation is tiresome and they have no regular work to do. Therefore, it seems to be demonstrated that the health of the pupils and teachers is not injured by the summer work.

The Gain in Time

The third reason for the establishment of the schools is to save time. On the average, schools are in session less than half a year, about 190 days, because of the many holidays and the vacations. The average school in the United States is open 70 days less a year than the European schools. The summer vacation is a survival of the time when the business of the country was largely agricultural. The children were needed to help on the farms. The conditions in the cities do not justify such a plan now. Because of the time element vast numbers are prevented from obtaining an elementary education.

> The all-year plan provides a way by which ambitious pupils may save time in getting an education. By continuous attendance for three years a pupil may finish a four-year course. The speed of the work ought not to be greater than the pupil's ability to assimilate knowledge or more rapid than his mental development. If anyone finds the rate too rapid, the plan is flexible enough to permit him to omit some terms and still gain time. The school continues, although the individual may not attend every term consecutively. The opportunity is his, if all personal conditions are favorable.

Under the all-year plan the work of the eight grades is done in six years instead of eight. A pupil attending four twelve-week terms in any calendar year gains one-third of a grade over a pupil under the regular plan. Pupils who entered the regular grade in September, 1912, will enter the high schools in September, 1920, but under the all-year plan those who entered in September, 1912, entered the high schools in September, 1918, two full years earlier.

That these schools are taking more pupils through school—the results of gaining time—is evident from the following facts: one school, during the six years preceding the inauguration of the all-year plan, graduated 268 pupils; during the six years

following, it graduated 836 pupils. In this time it graduated twenty-four classes, twelve more than it would have graduated under the old plan. The number of pupils in these twelve extra classes was 417. If the old plan were in use, these pupils would still be in school, and there would be, at a conservative estimate, ten half-day classes in the building. Many of the pupils would not have been able to stay at school to graduate under the old plan.

An Actual Money-Saving

The superficial critic will assert that there has been an increase in expense in maintaining the all-year schools, for teachers are paid two months' additional salary for July and August. Those who have had one year of successful experience in an *all-year-alternating* school receive in addition a bonus of five per cent on their salaries. In the all-year-alternating schools there are more teachers of the special activities who are on a higher salary schedule. The cost of the equipment and operation of the building is greater. Consideration shows that the increase in salary is justified because of the increase in the length of the day and in the length of the year, and because the work is more onerous and requires greater ability on the part of the teacher both as a disciplinarian and instructor. To offset this increased cost in salary, number of teachers, and equipment, the pupils are accelerated in their progress through the schools and others take their places; thus a larger number of pupils are accommodated in a given time.

A study of the promotion records of the five schools shows the actual saving effected. To make it clear it must be remembered that the all-year plan covers in three twelve-week terms the work of a year as outlined in the curriculum, so that in three years a full year would be saved. To illustrate the principle, the summer, or August, promotions for three years in one school were 1,093, 966, 1,046. *Dividing the total for the three summers by three, the average number of pupils who gained a year is found to be* 1,035. *The per capita cost in this school for the middle of the three years was* $33.60. *Multiplying it by* 1,035, *the cost of instruction was* $34,776. *The cost of maintaining these three summer terms was approximately* $24,000. *The saving was then approximately* $10,776.

Another means of saving is in the reduced building expenses. Newark's educational problems are similar to those of other great American cities, among them the problem of providing school accommodations to meet rapidly increasing demands. For the first time in many years, in the fall of 1917, because of the introduction of all-year and alternating schools, there were no children on part time in the schools. The cessation of building operations, due to war conditions, changed that satisfactory state of affairs temporarily. The district of the oldest all-year school has been enlarged three times in order to provide pupils for the same number of teachers. It is clearly seen that by changing this school to an alternating all-year type and putting one of six other schools within a radius of seven blocks on the same plan, one of the five remaining buildings in the circle can be released to be used as a junior high school, or for some type of school that shall serve the whole city.

The all-year-alternating schools have more classes than they were constructed to accommodate. One school has seven; another, eight; another, eleven; another, seventeen; and a fifth, five. To accommodate these classes additional buildings would need to be erected. The cost of these forty-eight classrooms, at $12,000 per room, would be $576,000. The saving may be further illustrated by supposing that there are two schools, one on the old plan and one on the new, each enrolling 2,000 pupils. To educate the children in eight years on a forty-week basis at 90 cents per week ($36 per capita per year) will be $576,000; for six years, of forty-eight weeks each, $518,400. *This shows a saving of* $57,600.

In New Jersey the state makes its apportionment of school moneys upon the basis of the number of days' attendance. The extra attendance in July and August, therefore, adds greatly to the amount of money received from the state. Although these schools were not established primarily for purposes of economy, it is clear that this is one of their characteristics.

The Change Should Not Be Abrupt

Notwithstanding the success of these schools, it is inadvisable to introduce them any faster than supporting public opinion

can be secured. They require the adjustment of the habits of the community. They require changes in curricula—both elementary and secondary. They require a different attitude on the part of teachers—elementary and secondary. When introduced, the best plan is to change one or two schools at a time. The best schools for the purpose are those in congested neighborhoods where the children remain in the city during the summer time. It is well to make concessions to the established order of things as far as possible. Instead of a plan requiring terms of twelve weeks with a week of vacation between, better a plan giving two weeks in late summer, a week at Christmas, and a week in the spring. This has worked fairly well and is a less violent way of treating the community.

In selecting schools for the experiment it is well to remember that the two-language school presents the greatest difficulties. All must acknowledge the handicap of the use of a foreign language at home and of a different language in school. The acceleration of the all-year plan makes it difficult for the two-language pupil. The acceleration also brings into the upper classes of these schools younger pupils who have not the general information of native Americans of the same age. There will be in these upper classes older pupils who, in ordinary schools, would be the retarded pupils in lower classes. These facts constitute reasons for having able teachers for the work if such a school is selected and not for depriving the children of the opportunity to gain the advantages of the all-year plan. It is the greatest Americanization agency yet established.

These schools make for the happiness of the children and the comfort of the parents. To many of the children, school is the most enjoyable experience in life. Many even object to one session on stormy days. To many of the parents, school gives relief from much trouble and worry. At home the children are in the way; on the street they are in danger, physical and moral; in school they are safe.

Vital Statistics and the Physician

By Rufus C. Pennywith, M. D.
Registrar of Vital Statistics, Dayton, Ohio

IF a physician wishes to have his day's work complete and to contribute his part to scientific achievement, he must make prompt and accurate reports of births and deaths, thereby helping to compile accurate statistics. Statistics are many times misleading and inaccurate, but birth and death statistics can be absolutely accurate if physicians will make a full and complete report. A prompt and complete return of birth and death certificates is mandatory by law, and punishment is provided for in case of failure to perform either.

Physicians often complain of the burden imposed upon them of reporting births without being compensated for the work; but if they would only think of the service they render to the individual, the city, the state and the nation in the matter of statistics alone, they would see it in a different light.

For many reasons it is of vital importance to the individual that a record establishes nationality, school age, working age, aids soldiers' widows in securing pensions, establishes relationship in the matter of settling estates and is necessary in securing a passport to travel in foreign countries. Without accurate vital statistics, a city, a state or a nation cannot check its gains by births or its losses by death. A nation's wealth is not in its lands, waters, flocks, minerals or forests, but in its people; they alone determine its present and future standing among the nations of the earth. Accurate vital statistics aid in infant welfare work and assist those whom we place in charge of the health of a community to perform their work more wisely and well. Don't fail to report births promptly and sign death certificates accurately.

Forward Steps
Reported to THE AMERICAN CITY by Municipal Officials & Department Heads

City Managers

Life Insurance for All the Employes of a City

ALBUQUERQUE, N. MEX.—The city of Albuquerque has undertaken an innovation in the way of municipal management in the form of life insurance for all employes of the city, from the City Judge to the garbage collectors. The program includes all employes of the Board of Education and the teachers in the city schools.

The City Manager entered into the contract for the city, and M. E. Hickey acted for the Board of Education, as President. The insurance is given without cost of any kind to the employes, and its benefits are in addition to employes' compensation. About 125 persons will be benefited by this unique program. The plan extends to all employes immediately on entering the service; they receive $500 of insurance during the first six months, and $1,000 during the second six months of employment. At the end of each additional year of service an additional insurance of $100 is presented. Among the city employes this year-to-year increase in the amount of the insurance continues until a maximum of $1,800 is reached. For the Board of Education there is a maximum of $2,000. In both instances the plan is made retroactive as to length of service.

Among the employes on the city pay-roll are eleven mechanics, three laborers, and eleven clerks. There are eight policemen, seventeen firemen, the City Judge, the City Doctor, the City Chemist and the City Attorney. The blanket policy requires no medical examination and is issued without regard to the ages of the employes. The action of the Albuquerque authorities is the first instance of the extension of such a program to all the employes of a municipality, but it is estimated that there are today one million industrial workers protected by this form of insurance.

JAMES N. GLADDING,
City Manager.

Recreation Departments

Intensified Use of Recreation Grounds and Buildings

INDIANAPOLIS, IND.—Prior to 1919 no definite recreation plans had been developed for Indianapolis as a whole, and there had been a lack of perspective in regard to the future activities of the Recreation Department. That condition was carefully considered during the survey which was made of the entire city in order to determine its recreational needs. Previous to this time the Recreation Department had been identified with the Board of Health and Charities, but the Legislature had passed an act providing for the uniting of the Recreation Department with the Park Board. As a result of this act the Department has been authorized to condemn such ground as is available for recreational centers and to provide for properly equipping it. Bond issues for such purposes have been greatly fostered by this act of the Legislature. The demand for recreational centers in Indianapolis has increased, and more disposition to establish them has been shown among officials. Citizens from all sections of the city are showing eagerness for them. The public need for recreation centers in Indiana is almost as well recognized as that of the schools.

The Recreation Department has adopted the slogan "Intensify the use of the grounds

THESE BOYS FROM ONE OF THE INDIANAPOLIS PLAYGROUNDS HAVE MADE THE BIRD HOUSES WHICH THEY ARE DISPLAYING

and buildings." In carrying out our slogan we realize that the secret of success lies in leadership, and an earnest endeavor has been made to secure the best leaders and assistants, in order to make our playgrounds and recreation centers the vital force they should be. Realizing that there must be a continued process of education for our workers, it is hoped that in the near future we shall be able to establish a school for recreation work in connection with the department. In the meantime our recreation workers are taking an excellent course given by the Indiana University Extension and the Y. W. C. A. The North American Gymnastic Union is also a very helpful source from which to get trained workers.

We have been led to realize that the playground and recreation centers are one of the most democratic influences in the life of a nation, because the people, both rich and poor, meet each other on grounds where all are equal. We have considered this phase of the playgrounds and have attempted in many cases to organize the grounds on the self-government plan. Under this plan all are made responsible not only for personal behavior, but also for the general conduct of the crowd and the appearance of the ground. The very fact that the people are trusted with this responsibility has made them desirous of everything that would mean progress and better opportunity for all. In this way the children have learned to appreciate each other and to understand that democracy is sustained by justice for all, sound cooperation and good-spirited team-work.

An earnest attempt has been made by the members of the department to encourage natural and unrestricted play where the children shall become good comrades and abandon all artificialities. As a result of this type of play, qualities of self-forgetfulness and thoughtfulness of others have developed.

The playground season was opened on June 6 in 1919, two weeks earlier than in the past, and closed September 6. The parks were open until October 15 after school hours.

In arranging an evening program for adults, it is essential to know what the people want and to provide the activities through which they may find expression in a way that will give them the most enjoyment. The result of such community ac-

tivities as pageants, community sings, community dramas, neighborhood parties and various other celebrations has been to draw the people together as members of the community and not as boys and girls and adults. "Motion pictures take *everywhere* to the people and destroy the otherwise galling limitations of time, space and circumstance." Singing together has tended to weld thousands of individual minds into one community spirit. That welding has been the task of our department—to create the community mind. So great was the demand for music during the winter months that The Messiah and other high-grade compositions were given to capacity houses. Distinguished artists have come to Indianapolis to take part in our community programs. Through the coöperation of the Board of Education and the Park Board, these concerts have been given free to the public.

According to the judgment of many citizens, the Recreation Department during the year of 1919 enjoyed its most successful season. Reports from Judge Collins of the Criminal Court, and Judge Lahr of the Juvenile Court indicated that our work is helping to reduce the number of delinquency cases in their courts. "Give a boy a chance at football, baseball or basketball; give him an opportunity to perform difficult and dangerous feats on a horizontal-bar, on the flying-ring, or from a diving board, and the policeman will need a gymnasium himself, to keep his weight down." This is not theory; it is the testimony you will get from any policeman or teacher who has been in the neighborhood before and after a recreational center has been started.

R. WALTER JARVIS,
Director of Recreation.

Health Departments

Dental Clinics in Schools

NEW YORK, N. Y.—Dental clinics for school children in New York have been maintained for a number of years by the Bureau of Child Hygiene of the Department of Health. There are eleven of these clinics, located in the various boros of the city, nearly all in public schools. This work is of interest to all who are concerned with the physical welfare of city populations.

DENTAL TREATMENT OF NEW YORK CITY SCHOOL CHILDREN

During 1918, the dental staff comprised one supervising dentist, nine operating dentists, eight nurses, and three dental hygienists—young women especially trained, and competent to instruct in dental hygiene and to do actual prophylactic work in the mouths of children as demonstrations of the principles taught. War economy necessitated the dropping of these three hygienists, but it is hoped that because of the good results which they accomplished, an increased number of equally skilled instructors will soon be provided to continue the work.

The limited staff is unable to reach all school children needing dental treatment, and it has therefore been the plan to select children from the age of school entrance up to 10 or 12 years. During this period a child's mouth is in a transitional stage, and work done at that time will have a good effect upon the adult development and condition of the mouth. The work is necessarily limited to pupils of the schools in which the clinics are located, and the younger children receive first attention.

On certain days the clinics do work for other children who have applied for employment certificates and cannot pass the required physical examination on account of the condition of their teeth. Another important factor in the work is the dental treatment of children predisposed to tuberculosis who are being sent away to preventoria.

The work done by the dentists consists of filling, extraction and operative treatment, with lectures and other instruction. Nurses are in charge of each clinic and are responsible for the maintenance, care and preservation of records, instruments and other equipment, and for the discipline of the clientele. In spare time they also lecture and do instruction work.

The dental hygienists carry their instructions to even greater numbers of children and parents than are reached by either dentists or nurses, and at the same time do routine inspections of children's mouths, calling attention to gross defects found, and directing the child to see the family dentist. In such cases it has been possible to get the coöperation of the family to a surprising extent. A small card is used, stating that the child's mouth needs attention, and requesting that the card be returned signed by the dentist who does the work. The children take these cards home, and in many cases return with the work completed and the cards duly signed.

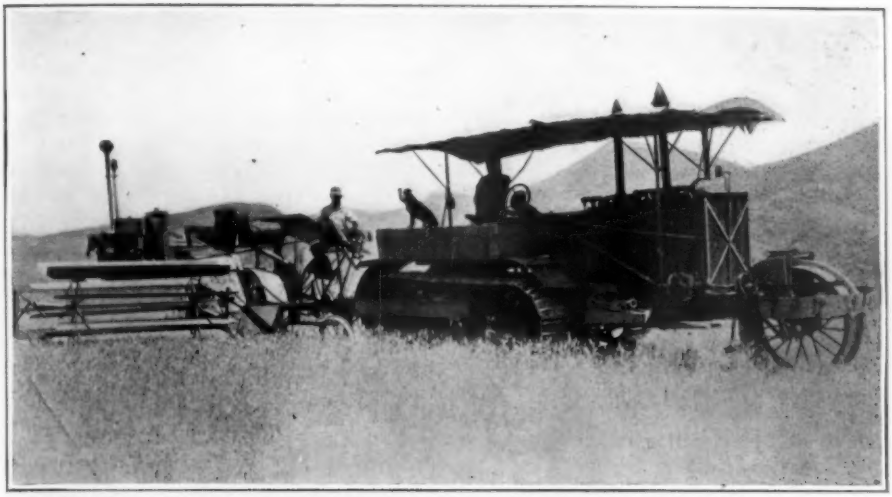
The idea on which all this dental work is based is to impress the children with the knowledge of what a clean, healthy mouth is, and the aid it is towards a healthy body. The children are taught how to keep their mouths in good condition, and it is endeavored to make them understand what good dentistry is, so that they will not fall into the hands of charlatans. At the end of certain periods, varying from six months to a year, all children who have been treated are required to return for examination, in order to ascertain the result of previous instruction and the condition of the work done. It has been found that over 80 per cent of these children need very little new attention.

All the nurses connected with the schools have been thoroly instructed in ideas and methods related to the teaching of dental hygiene to children. It has been found advisable to adopt for the children the rotary motion of the brush in cleaning the teeth, as from all standpoints this method seems most applicable and teachable. It is the one taught in the large majority of educational institutions. Lectures and talks are given not only to the children themselves but to any group or organization connected with the school.

In schools where this dental work has been done, and particularly where dental educational propaganda has been conducted, the teachers and principals say that they have noticed the effect upon the children, especially in what may be termed the improved tone of the pupils' personal hygiene. As further evidence of the practical side of the work and of its appreciation by all, the Health Department is in constant receipt of requests to extend the work. The principles involved in this important undertaking are applicable to many cities.

R. L. COPELAND,
Commissioner of Health.

"Do everything you can to improve the schools, not so much by way of criticism of what is bad as by praising what is good. Take the school that is best in your community and talk that up. Make other schools see their deficiencies by comparison with the good school."—*Dr. J. E. Gregg, Principal of Hampton Institute.*



BEGINNING THE 1,200-BUSHEL HARVEST OF WHEAT ON ENSIGN FLAT, NEAR THE STATE CAPITOL, SALT LAKE CITY

Park Departments

A City That Has Come Back to the Farm

SALT LAKE CITY, UTAH.—Nearly everybody at home learned something of truck or back-yard farming during the war, but it was not the war which forced the municipality of Salt Lake City, through its department of parks, into the ordinary business of farming. It was largely the necessity for bringing up a few orphaned farms, along with the acquiring of some mountain and canyon watershed lands, that brought about this undertaking.

With the farms came a considerable amount of machinery, and the necessity for utilizing it economically. Some needful machinery that was lacking was purchased. The machinery and implement outlay was out of proportion to the amount of land that had been acquired, hence several hundred acres of virgin and park land within the corporate city limits were brought under the management of the city's farmers, to make the whole proposition more profitable.

Much of the farming done on small segregated tracts of city-owned land two years ago was for the purpose of stimulating interest in war gardens. This has been continued because of its profitableness, and because of the need for producing a variety of crops to be used as feed at the city Zoo in Liberty Park. The vast quantities of alfalfa hay, bedding straw, oats, wheat, rye, corn and vegetables which are necessary have been produced almost exclusively on the city's farms—even the carrots for the bunnies and the popcorn for the monkeys in winter. The city seems securely established as a farmer.

In utilizing the available ground to the best advantage, and at the same time not overworking the machinery or the men, it has been desirable to grow much larger quantities of certain crops than were necessary for city consumption, such as wheat and potatoes; but in the last two years the income from the sale of these has more than paid for all the machinery purchased, including a potato digger, a large caterpillar tractor, a combined grain harvester and thresher, a hay press, and numerous smaller harvesters and implements. Indeed, the yield of 1,200 bushels of dry land grain grown each year on 70 acres in the Ensign Flat field, just above the State Capitol, and within direct view of the entire city of Salt Lake—a field that had never before grown a crop—was sold for $2,600 cash, which more than paid for all the implements used in growing and harvesting the crop.

The tractor has been transferred to the city and used regularly on the streets and in the parks for grading and heavy hauling, when not needed on the farms; some of the plows and levelers have also been used for street and park grading; the teams have been used as occasion required in delivering feed to the menagerie, and for other duties; and in other ways the farming department of the city has coöperated with the park department, as none of the farms are more than a few miles from the city.

The Mountain Dell farm, the so-called Resort Farm, and the Pest House farm, each consisting of several large fields, with ample fences, pastures, buildings, implement equipment, and livestock, are situated at scattered places in Parley's Canyon, one of the city's watershed areas, and these farms will in all probability be maintained permanently for general farming. All have more or less irrigation water and excellent soil, and as long as conditions thereon are properly controlled no harm can result to the watersheds nor to the city water-supply.

A large acreage of corn, potato and general truck lands which has yielded exceedingly well on the city's west side, in a fine alluvial soil along the Jordan River, is still maintained like a series of war gardens. These more distant park areas are not at present kept up as parks or resorts in their entirety, but are set apart for future use as such. As there is great need for diversity in the bill of fare at the Zoo, such as these lands produce, these areas will be very largely farmed henceforth, under the present plans of the city officials.

The Ensign Flat dry farm, overlooking the city from the north, was a daring venture, entered into at the suggestion of a number of experienced dry farmers who felt not only that the idle land would produce grain without water, but that it should be utilized as a small weapon against the high cost of city governing and of living in general. The slope is southerly, the subsoil a gravel, and the season was not the most favorable for conserving moisture, yet the tract was handled so efficiently, from its initial clearing to the final harvest last year, that an excellent record has been made. The assured wheat prices increased the profits over what can probably be expected in the forthcoming season; moreover, following the most approved dry-land practise, it seems wisest to fallow the land for one season for moisture accumulation before planting another crop; hence the brilliant stubble patch, like a scar in the world of sage and other browns, will remain undisturbed in 1920.

A. H. CRABBE,
Commissioner of Parks and Public Property.

THE MUNICIPAL "REST ROOM" IN PHŒNIX, ARIZ.

WOMEN'S LOUNGING ROOM IN THE BUILDING SHOWN ON THE OPPOSITE PAGE

City Engineers

Not Like the Ordinary Municipal Rest Room

PHOENIX, ARIZ.—Until recently when the vast irigation projects and the appropriation of millions of dollars for various improvements brought in thousands of homeseekers, Phoenix had been noted throughout the country as an ideal place for a winter home and as a tourists' city. Among the comforts provided by the citizens especially for passing tourists and visitors is a municipal rest room. It is like a patent medicine in that it serves many purposes, and unlike the same because it gives absolute satisfaction. Although combined with a band-stand, which also serves as a public speaking platform, it is essentially a women's rest room.

The architecture is of no one particular style. The building was designed to serve so many purposes that it looks like a cross between a bungalow and a Japanese cottage. Nevertheless, the appearance is pleasing. The exterior is finished in pebble dash, sand finish and cement plaster. It is one-story with a three-quarter basement.

On the first floor are a waiting-room, a check-room, a lounging-room, which is also the library, a nursery and a men's toilet. The rooms have beamed ceilings, maple floors and plaster walls.

The entire basement is for women. It has a rest room, a toilet, a nursery and a kitchenette. The floor is of concrete.

The women's rest room on the first floor is the lounging room. It resembles the ordinary municipal rest room about as much as a living-room in a home resembles a cell in a municipal jail. It is nicely and comfortably furnished with easy wicker chairs and couches. The center table is always loaded with newspapers, magazines and flowers. A bookcase in one corner, which is a branch library of the city library, has a capacity of 1,000 books and is always full.

The walls are tastefully decorated with oil paintings, contributed by the women of Phoenix. The carpets on the floors harmonize with the furniture in color. And each room has a fireplace.

Not only do motorists drop in for an hour or two to refresh themselves, but the women of Phoenix come in to rest after shopping. The wives of farmers find it an ideal place to spend part of the afternoon. They may leave their babies in the nursery and then go out to do their buying.

The kitchenette in the basement is equipped with gas stove, cupboard, sink and refrigerator. This is one of the most popular features of the building. In a few minutes those who wish can prepare a cup of tea or chocolate for a light lunch. Many girls whose homes are far out, keep provisions in the storeroom and prepare daily lunches in the kitchenettes.

The rest room is located in the city hall plaza. In the evening, occasionally, the band entertains the citizens and visitors, who may sit about on benches or on the lawn under spreading umbrella trees. The band-stand takes up the length of the building on one side and is constructed like an alcove. It is 15 feet high and 12 feet deep at the center point. A circular platform of concrete projects 8 feet.

Very few cities of 40,000 population have such a municipal feature, even though it cost only $4,300. It is something which every city needs. Whether it is merely a place of four walls wherein to kill time, or a corner like one's home, depends upon the person in charge and also upon the funds available.

The Phoenix municipal rest room is in the care of Mrs. Ida R. Abbot, who is matron, librarian, nursery maid, check girl, hostess, and possibly confidante.

A. S. GREGORY,
Office of City Engineer.

Police Departments

A Lunch Wagon for Policemen

New York, N. Y.—A lunch wagon is a part of the equipment of the New York Police Department. This "wagon," which is a motor truck with a covered express-wagon body, was presented to the Department by the writer, for use in furnishing hot coffee and sandwiches to members of the force on duty in exposed places in inclement weather during the winter months, and cooling refreshments in the summer time. It can also be used for the transportation of members of the force from one point to another in emergencies.

JOHN A. HARRISS,
Special Deputy Police Commissioner.

MOVABLE LUNCH ROOM USED BY THE NEW YORK POLICE DEPARTMENT

Libraries

A Library Service for Hospitals

Sioux City, Iowa.—The Sioux City Public Library in establishing its Hospital Service has undertaken an entirely new line of work from the public library standpoint. The idea is a development of the service of the A. L. A. Hospital Librarian in the military hospitals, and was inaugurated in Sioux City in December, 1919, by the writer. The hospital authorities are enthusiastic about it, and prominent physicians of the city have given it their hearty support.

A hospital librarian was appointed and the people of the city were asked to contribute books.

DISTRIBUTION OF PUBLIC LIBRARY BOOKS IN THE SURGICAL WARD OF A SIOUX CITY HOSPITAL

Wide publicity was given to types of books wanted and even to lists of specific titles suitable for hospital use. Over 5,000 volumes were secured. A collection was then placed in each of the six hospitals of the city, ranging from 300 to 500 volumes and supplemented from the main library by special requests. The Hospital Librarian visits each hospital twice a week and finds out from the patients what kind of reading matter is desired, whether it be a book of light fiction, a magazine, or a technical book. Reading aloud is encouraged. Six specially designed book-trucks have been placed in the service. These are wheeled to the patients' bedsides and thus facilitate book selection.

After conferring with physicians and hospital authorities, as a matter of precaution and to safeguard against the possible spread of disease, the following plan has been adopted and rigidly adhered to:

1. Each hospital has its own permanent collection, and books are not transferred from one hospital collection to another.

2. The books in each hospital collection are fumigated at regular intervals.

3. Under no circumstances are books circulated to patients having contagious or infectious diseases. The Hospital Librarian makes it a point, on entering the hospital, to first secure a list of such patients as may be confined with contagious or infectious diseases. The number of each patient's room is taken, and these rooms are carefully avoided.

4. Any books borrowed from the main library for special requests are thoroughly fumigated before being placed in circulation again.

C. W. SUMNER,
Librarian, Sioux City Public Library.

Editorial Error in April Issue

Our attention has been called by Alex Henderson, Chief of the Fire Department of Kansas City, Missouri, to the fact that a photograph of motor fire apparatus which appeared in the April issue of THE AMERICAN CITY bore a caption stating that the fire apparatus belonged to Kansas City, Kansas. We are glad of this opportunity to correct the mistake and give Kansas City, Missouri, the credit for this excellent showing of motorized fire department equipment.

Prevailing Methods of Garbage Collection and Disposal in American Cities

Part II

By Thomas F. Moore
Secretary, Chamber of Commerce, Waterbury, Conn.

EDITORIAL NOTE:—*A committee of the Waterbury Chamber of Commerce has made an extensive and intensive research into the problems of collection and disposal of municipal waste. Questionnaires covering the matter in detail were mailed to about two hundred cities throughout the nation. Typical instances of successful systems in other cities were visited and inspected. In addition to this general survey, a study was made of local conditions for the purpose of adapting to Waterbury's needs those successful features which characterize the methods of other cities. The following is a summary of those portions of the report which are general in application and which will be of value to other communities.*

Equipment

The equipment to be used in a particular case depends upon grade, pavement, traffic and general topographical character of the given city, and is an important item of cost and sanitation. Various combinations are found throughout American cities, including double and single wagons, auto trucks of different capacities and trailer systems. Cities which are not especially hilly and which are possessed of wide streets can use a trailer system to advantage, but the custom and practice most common is confinement to the use of the wagon. The reason is readily observed in the routine of collection whereby stops are made at short intervals from door to door, in which an auto would be cumbersome. The electric-driven vehicle would be more expedient than the gasoline-driven, particularly in the matter of short stops, but neither has the flexibility of the wagon. For hauling purposes, the auto is obviously an advantage where loading stations and a trailer system can be adapted, but unless long hauls are necessary, sole use of wagons is advisable, for in a haul of from one to two miles nothing is gained by unloading at a station and then reloading into an auto for the straight run to the place of disposal; the extra equipment, labor and time involved entirely negative the difference in speed of the two kinds of vehicles. Loading stations are advisable for cities of great length where the place of disposal is not situated equidistantly. The point at which a motor vehicle would not be cheaper than a horse-drawn vehicle is a distinct problem for any locality; in garbage collection and haul it would be at least a two-mile minimum.

Many wagon-builders have special garbage vehicles. It is essential that the wagon be water-tight, well covered with hinged tops of metal or canvas, and of strong frame and construction. The loading height should be sufficiently low to prevent unnecessary effort for the collector.

Bottom-dump wagons are not successful as garbage vehicles because of the large amount of liquid contained in the average production; side or rear dumps are more sanitary and manageable. The capacity of the great majority of wagons used is two cubic yards. Some cities use the single wagon of one-cubic-yard capacity, but this is extravagant, as stated above, except for stops at great intervals. Three-, four- and five-cubic-yard wagons do the work in larger cities. Wagons with sanitary features cost between $150 and $500; there are very satisfactory ones on the market at $300 to $400.

Cost of Collection

Of all the variable phases of the garbage problem, the cost of collection is most changeable from city to city, for it depends on all the other items. Before the rise of prices to the present level, the cost per ton of garbage collection ranged from $2 to $3, the lower figure for the smaller communities. At the new price level, costs have increased so that they now oscillate between $3 and $5 per ton collected. Garbage collection and disposal being a true

community problem, affecting every resident, the cost should be met from the general taxation levy.

Education of the Householder

The success of any system of collection and disposal is to a large degree dependent upon the coöperation of the householders. Foreign material must be kept out of the garbage receptacle, and the use of improper receptacles must be strictly prohibited. A scheme of advertising is advisable at various times to insure the proper house treatment.

Some cities use a system of wrapping, insisting that all garbage be wrapped in paper. The idea is most adaptable to places where incineration or dumping is the method of disposal.

Coöperation of City Officials

The thorough coöperation of various city officials is essential to the complete success of any system of municipal activity. Of especial importance is the readiness of the prosecuting attorneys to enforce the ordinances requiring sanitation. A system of inspection to be followed by the sanitary inspectors should be devised, and the assistance of the police is also of decided importance.

Collection Ordinances

The whole machinery of garbage collection can be assisted in its operation by the existence and enforcement of relating ordinances such as the following:

1. An ordinance establishing municipal collection and forbidding the collection of garbage within the city limits by other than municipal employes so authorized, except in emergencies, when the superintendent of garbage may authorize a party to collect it for a definite period of existing necessity.
2. An ordinance defining garbage and forbidding and providing a penalty for the mixing of foreign material with the garbage to be collected.
3. An ordinance establishing the frequency of collection, the type of wagon to be used, etc.
4. An ordinance defining the jurisdiction and authority of the officials employed for the handling of the city's garbage, including the method of handling complaints.
5. An ordinance assuring general sanitation throughout the whole process of collection.
6. An ordinance requiring the occupants of houses to furnish a sufficient number of receptacles of the proper size and style, and establishing their location.

Disposal

The proper disposal of garbage is one of the most frequently studied problems confronting American communities to-day. This fact is evidenced by the 135 cities out of 596 with a population of over 10,000, or 22 per cent, which are contemplating changes in their method of disposal. The solution varies with the population; hence a small community is subject to an evolutionary requirement in its disposal system. For cities of 100,000 and over, however, the solution is fairly stable, and is becoming more so.

The three factors to be considered principally in determining the correct method for given conditions are: 1, cost; 2, sanitation; 3, utilization of economic content of garbage. While sanitation in disposal affects only a small proportion of the population, it should nevertheless be sought in any system adopted. Aside from sanitation, which is generally secured with greater degree in disposal than in collection, the principal item is cost, which varies with the size of the city as well as with the method, a given method being conducted at profit or at loss in different-sized cities. The type of disposal is also dependent for its success and adaptability on the type of collection. While general principles can be nominated for general conditions, the local complexion of a given community must be thoroughly studied from the viewpoint of each system of disposal, to insure selection of the best combination. The prevailing methods of disposal in American cities are as follows: 1, dumping on land; 2, dumping into large bodies of water; 3, burial; 4, sanitary fill; 5, feeding to swine; 6, incineration; 7, reduction.

1. *Dumping on land.*—Where this is practiced, garbage is dumped with ashes and rubbish on waste land remote from the city. The method is crude and unsanitary, and is fast becoming obsolete. Regardless of the proportion of ashes and other refuse mixed with the garbage, the fermentation and putrefaction will necessarily produce offensive odor and cause a distinct nuisance. This system is applicable, if at all, only to sparsely settled areas where waste land is available at considerable distance from all residences, so that for cities which

have assumed fair proportion it is not worthy of consideration, endangering, as it does, the health, appearance and convenience of the surrounding area.

2. *Dumping into large bodies of water.*—This method is based on the fact that water will dilute most constituents of garbage which do not sink. It has been found, however, that generally the most unwholesome parts of the garbage remain on the surface and produce offense. Great inconvenience and unsanitary conditions have arisen from the refuse washed on shore. New York City carried garbage to sea in scows, a very expensive hauling system and one creating offense from the garbage washed ashore and floating. The Federal Government has stopped this practice on the Mississippi River, and there is general opposition to its inauguration anywhere. Like the first enumerated method, it is both unsanitary and wasteful, but unlike it, it is applicable only to cities situated on very large bodies of water.

3. *Burial.*—Burial is another method particularly applicable to small places and liable to prove offensive and costly. It consists of burying the garbage in small trenches or in ploughing it into the ground. It requires a large amount of land, situated far from the residential area, a fact which means great cost of haul. While this system has been successfully used in some places, it has often created a nuisance, and the chances of its doing so are predominant. Unless the utilized ground is devoted to farming because of its richly fertilized soil, there is great loss of the chemical content of the garbage. From one to three acres, depending on the quality of soil, are required per year for each daily ton of garbage produced. The same ground can be used again after two or three years. Some large cities have adopted this method in the past, but have changed to the more convenient and profitable means which are readily affordable for large cities. This method, then, is limited decidedly to small communities.

4. *Sanitary fill.*—This method is decidedly distinguishable from dumping or burial, in that it is more sanitary, less costly and is productive of eventual return. It consists in filling low places, excavation, water-fronts and the like with the garbage, other refuse and earth, thus producing more marketable and usable ground of considerable value in many cases. The garbage is spread in thin layers and covered with sufficient ashes, refuse and pure earth to allow necessary oxidation of the decomposable matter. The bacteria of the soil, under favorable environment, break down the organic substances without causing offensive odors such as would accompany putrefaction or fermentation in the open air. To be effective, careful management of the process is essential, to provide sufficient mixture of inorganic material, burial at the exact depth and in sufficient quantity and necessary drainage facilities. Properly handled, the method is sanitary, economical and often profitable per se. In this way, it will cost anywhere from 50 cents to $1 per ton disposed, not counting the added value of the reclaimed land, which may more than pay for the disposal.

For cities of 25,000 to 100,000, the value of this method is worthy of consideration. Cities of this size have reached the stage where pig feeding is becoming cumbersome and liable to be offensive and where mechanical means of disposal are likely to be resorted to. For places where the conditions are favorable, the sanitary fill will be as sanitary as and more profitable than incineration. Seattle and New Orleans have successful sanitary filling-in operation. The latter city conducts playgrounds on this reclaimed land, which is made to assume the aspect of a park. Seattle has had considerable success with this method of disposal and has found it to be less costly and more remunerative than the incineration plant. The city has eleven filling spots in various sections, eliminating long hauls. This method, which is really reduction by nature, is worthy of careful thought by cities of 25,000 to 100,000 where conditions provide possibilities for filling sites. There is danger in some cities that it is only temporary, because of scarcity of low places, but it is possible as a temporary method for any city which finds itself without an adequate means of disposal.

5. *Feeding to pigs.*—This method is probably the oldest method of garbage disposal and was the prevailing system thirty years ago. It is applicable and can be satisfactorily adapted to a city having a population under 25,000; modern cities of more than 25,000 generally utilize a mechanical means of disposal. Of the 66 cities estimated as having over 100,000 pop-

ulation in 1916, 20 cities, or about 30 per cent, have this method of disposal, while of the 544 cities having between 10,000 and 100,000 in 1916, 200 cities, or over 36 per cent, feed their garbage to hogs. The reason is partly historical, partly logical. The test of applicability for this method includes strict requirements of sanitation and efficient management. Its history has been marked with both failure and success; many plants throughout the country have been ordered closed to abate a nuisance, while others prosper with satisfactory sanitation.

Garbage as Hog-Feed

The utilization of garbage instead of grain as hog-feed has important economic significance and effect upon the food supply, and this is strongly in its favor when the method of feeding to pigs is adaptable to a given community. One ton of garbage is sufficient to feed from 75 to 100 pigs per day. A ratio of 1 pound of marketable pork to 50 pounds of garbage has been established, and with pork at 20 cents a pound on the hoof—and it now sells for slightly more—garbage as feed is worth $8 a ton, a figure which does not include cost of collection, haul and maintenance and depreciation of plant. Garbage, however, contains many ingredients which are useless as hog-feed. Pigs will not eat citric fruit, such as oranges, lemons or grapefruit, nor coffee grounds, and such things as soap powder, potash, lye, sawdust and the like are both dangerous and useless and must be disposed of otherwise when left untouched at the pig farm. Although garbage-fed hogs are daily sold as food universally, there is some aversion to this practice, but this is not well based. Some difference between garbage- and grain-fed hogs exists, principally as follows: garbage-fed hogs do not gain as rapidly; they show greater shrinkage in long shipment; they do not dress quite as high for market, being more watery; and they are constantly exposed to cholera. In spite of these facts, garbage-fed hogs are purchased on the market just as readily as grain-fed hogs.

Systems of Disposal by Feeding

This method of disposal, more than any other, is closely related to the system of collection. The various combinations which exist or are possible can be enumerated as follows:

1. Municipal collection—municipal piggery, a combination conducted successfully in a few large American cities. Worcester is the typical example. Its population is 185,000. It has two collections of garbage per week; the piggery is 3½ miles from the city and 6½ miles from the center of production. The cost of collection is very high because of the long haul, and averages $7.25 per ton. A 40-acre pig farm, costing $40,000 equipped, holds a minimum herd of 2,000 pigs. The city made a profit of $59,000 during 27 months of operation. Its success is due to scientific and permanent management.

Such an undertaking is venturesome for a city where the control and supervision is left to the fluctuating run of politics. An expert manager and competent bacteriologist and veterinaries permanently employed, are essential. Unless a person is financially and securely interested, pig-raising is most likely to be a failure. It would not be practical to recommend a municipal piggery under fluctuating political control for any city.

2. Municipal collection—sale to one contractor for disposal by feeding. This is probably the best combination under this system of disposal. The sanitation of collection is handled by the city, while the contractor is more likely to succeed in the piggery business. In this arrangement the contractor pays a certain amount, generally between $1 and $2 per ton for the garbage. Quite a number of cities are using this combination of municipal collection and single-contract disposal.

3. Municipal collection—sale to numerous contractors for disposal by feeding. This method is in practice in some American cities. Its success depends upon the coöperation between the municipality and the purchasers of the garbage. There is too great a danger, however, when the amount of garbage fluctuates seasonally, that the amount of garbage will not be sufficient for all and will not be justly proportioned. In the case of a single purchaser, he is able to adapt the number of pigs to the amount in season. This method, again, requires a wholesale supervision, which is difficult. Sanitation is not apt to be as good as under the single-contractor disposal.

4. Contract collection—contract disposal by feeding; both by one party. This method compares with the municipal col-

lection—sale-to-one-contractor method, except for the advantages of municipal collection.

5. Contract collection—sale to many feeders; a combination not likely to produce favorable sanitation and service. There is nothing that works for coöperation between collector and disposer.

6. Contract collection—municipal feeding is possible, but not practical.

7. Scavenger disposal system, wherein garbage is collected by numerous scavengers, who feed it to their own pigs. This is the most promiscuous and unorganized system possible, and, though cheap, is not satisfactory.

Requirements of a Satisfactory Piggery

1. Efficient management is the first requisite of a successful piggery. It includes a technical knowledge of the diseases to which pigs, and especially garbage-fed pigs, are susceptible, and of the serums necessary for cure. The ideal pig farm should be large enough to support the services of a trained bacteriologist, as in Denver's farm. The fact that garbage contains hog-cholera virus and there is daily exposure makes this advisable.

2. Distance from the city is quite necessary. The farm should be at least three or, better, more miles from the well-populated areas.

3. Situation. Good gravel land with sufficient drainage is likely to give satisfaction. The farm should be as far from any dwelling as is possible, and in that section of the city least liable to extend its boundaries of habitation.

4. Sanitation in the general management is of sufficient importance to deserve special emphasis. The city authorities should insist always on high standards of cleanliness.

Perhaps more so than other questions of policy, the consideration of pig-feeding as a means of disposal must be decided after a study of local conditions, political, economic and topographical.

Incineration

Incineration is a form of disposal introduced about thirty-five years ago. Since then there have been a few hundred plants of various designs established throughout the country. The theory of the incinerator is to cleanse and destroy by fire all combustible refuse, including garbage, rubbish and ashes. An incineration plant properly equipped is probably the cleanest and most sanitary method of disposal for all kinds of municipal waste. It produces little, if any, odor, and reduces all organic to inorganic matter. Incinerators of an early date were commonly called crematories and were too often a nuisance; the modern incinerator is more properly called a destructor. Most of these are of brick construction and have a fairly high rate of depreciation.

One type of incinerator used in a number of cities is the product of the Decarie Incinerator Company of Minneapolis. This destructor is of steel, water-jacket construction and has modern appliances for eliminating noxious odors and other inconveniences of the old type. The cost of installation is high, but the cost of maintenance and operation and the depreciation are ordinary. A successful incinerator for large cities is manufactured by the Destructor Company, New York, and is extensively used in England and the United States. One hundred and two cities out of 620, or 16 per cent, have incineration. This number includes 19 of the 66 cities having a population over 100,000.

Incineration is generally used for all kinds of refuse, principally garbage and rubbish. Ashes have an average coal content of 10 per cent, but it is impractical to incinerate for this small degree of destruction. Tin cans and other metal are reduced to clinker, and garbage and combustible rubbish become a fine ash. Incineration plants produce a considerable amount of steam, one pound of refuse creating a like amount of steam. A few cities have utilized this to advantage, but in most cases it has not been used because of the seasonal, daily and hourly fluctuation in the amount of refuse received at the plant, and because of the lack of connection between the incinerator and the purposes to which it could be adapted.

As a method of garbage disposal alone, incineration, while it seems most sanitary, is open to criticism as uneconomical, in that it is a complete waste of chemical organic matter. Many criticize the total destruction of an amount of garbage which could be adapted to the food situation. About 600,000 tons of garbage are destroyed per year. If all the garbage now being de-

stroyed in cities of from 10,000 to 100,000 population were used as hog feed, it would produce about 30,000,000 pounds of pork, with only 50 per cent efficiency. During the war, incineration was especially inadvisable on this account.

However, this process is worthy of the sincere consideration of communities of small or average size, especially of cities from 10,000 to 50,000 population. Whether a city of 50,000 to 100,000 population should establish this form depends upon the prospect of growth of that city both as to time and degree. For a city of 50,000 with little prospect of reaching 70,000 in less than twenty years, incineration is practical; while for one which will have 70,000 population in five years and 80,000 or 90,000 in ten years, reduction seems more practical. Cities of 70,000 and over with fair prospect of growth will probably find it more economical and inexpensive to choose reduction rather than incineration as a permanent policy, looking to the future. While incineration may often be at present less expensive and may continue so for a few years, reduction, as a definite, permanent policy, is the safer method. In any case, it is a question of prospective growth.

Choice of incineration must be made with due consideration of size, prospective growth and the policy of the city in the collection and disposal of all municipal refuse.

Cost of Installation, Operation and Maintenance of Incinerators

Incineration plants of brick and tile construction cost less than the modern Decarie steel-jacketed plant, but depreciate much more rapidly, and often require more labor for operation. As a permanent investment, with due concern for sanitation, a steel plant is by far the most practical and worthy of recommendation. The cost of a Decarie steel-jacketed incinerator with a 70-ton capacity per 24 hours of operation, or approximately 30 tons per 10 hours of operation, would be between $105,000 and $108,000, not including the site, while the cost of a 100-ton plant on the above basis would be between $134,000 and $138,000. The depreciation on such a plant would be ordinary, averaging 4 per cent to 5 per cent per year. This would mean a life of 20 to 25 years.

In an incinerator burning garbage only, the cost of operation would include an expense of 50 pounds of coal per ton of garbage burned, but if 25 per cent refuse were included, no commercial fuel would be necessary. The labor cost is estimated to be between 50 and 60 cents per ton of refuse incinerated.

Reduction

The most modern, and in many respects the most economical, method of garbage disposal is that which is termed reduction. This is a method of extracting from the garbage its inherent values, at the same time reducing it from an obnoxious matter to a refined and wholesome product. The inducive features of this means of disposal are its economy in conserving and utilizing the natural chemical value of the garbage and its sanitation in sterilizing the organic matter.

The introduction of reduction plants, or rendering plants, as they were first called, was historically subsequent to the institution of incinerators. When it was ascertained that garbage contained recoverable values inherent in the fats and chemical solids, mechanical means were devised to detract these and at the same time cleanse the garbage by heat. As is natural, the first attempts were more or less crude, resulting in only partial salvage of the inherent values, also in heavy cost of rendering, and producing obnoxious odors, a nuisance to the neighborhood, and depreciation of land values, equal and often greater than the salvage resulting. In late years, some, and principally one, type of reduction plant, have been built with freedom from unwholesome odors.

The first type of reduction was a drying process, cheapest of all, but not producing full recovery of grease because of carbonization. Offensive odors originate from the gases, which cannot be economically deodorized. It is now used in only three cities, Chicago, Alleghany and Buffalo.

The cooking method of reduction was next introduced, and also produced offensive odors, which in many cases, however, were to a degree eliminated at considerable expense, and by reducing the reclaimable values. Tankage from the cooking process has been declared suspicious as a fertilizer because of the length of time necessary for the chemicals to be released in the soil. This method is the most widely used be-

cause up to a recent period it was the most modern process existing. Approximately twenty American cities have reduction plants of this process.

The most modern type of reduction plant is a process of dehydration, instead of digestion. Plants have been established in New York, Los Angeles and New Bedford and are under construction in other American cities. The owners of the letters patent on this process guarantee sterilization of the material treated, elimination of nuisance during the process, and recovery of all valuable properties by the operation. The products obtained from one ton of garbage are as follows:

1/5-ton fertilizer tankage now valued at about $15 per ton	$3.00
70 pounds grease worth 7 cents per pound	4.90
30 pounds bones worth 1½ cents per pound	.45
Value of recovered products, approximately.	$8.35

Twenty-nine of the largest cities having reduction plants produce 36,000 tons of grease and 150,000 tons of fertilizer per annum valued at $11,000,000. This grease is sufficient to make 200,000,000 12-ounce cakes of soap. The fertilizer from twenty-five cities now wasting their garbage would replace the nitrogen removed from the soil for about 2,600,000 bushels of wheat. Our present stock of agricultural fertilizer is so depleted that reduction tankage is a natural resource not to be overlooked.

Reduction is not practical for smaller cities, the overhead charges being heavy, and must be spread over a large output of recovered values to be economical. This process is especially adapted to cities of 90,000 population and upward, and to those with a prospect of quick growth. In cities of 150,000 to 200,000 the disposal should result in a profit rather than an expense. The city of Los Angeles receives 51 cents per ton of garbage delivered at the plant of a contractor, who conducts a reduction plant of the dehydration process in the heart of the city. As a definite and permanent policy for the future of a growing community, the up-to-date reduction process is economical and commendable.

Cost of Installation, Maintenance and Operation of Reduction Plants

For a city of 100,000, which is close to the minimum size in which reduction is practical, the cost of installation would be between $80,000 and $100,000, depending upon local conditions as to value of site and cost of building. The cost for larger cities would not increase as much as the proportionate difference between the populations.

The maintenance cost is heavier than in an incineration plant, because of the more intricate mechanical nature of this process. Depreciation is somewhat faster also.

The operation of a reduction plant requires more men with greater ability than does that of an incinerator, about 15 men being required to conduct the operation in a plant for a city of 100,000 people. The reduction process would not ordinarily result in actual profit for a city of 100,000, because the overhead expense is too heavy to be met by the revenue from the amount of garbage reduced. However, reduction is cheaper than incineration for a city of this size, and should continue to become cheaper in the future as the city and the amount of garbage increase in size, whereas incineration is gradually more expensive under the same conditions.

Cities of 125,000 to 150,000 population should estimate closely on the cost and return of the reduction of their garbage, and in most cases should be able to estimate it as a financially profitable proposition. For municipalities of 200,000 population and upward, the dehydration process of reduction is by far the most practical and profitable and assures a high degree of sanitation and public satisfaction.

How Much Do Your Municipal Employes Receive?

The Bureau of Municipal Research of Philadelphia states that a family of two adults and three growing children require a minimum annual income of $1,803.14 to maintain the standard of living produced by $1,000 before the war.

Prof. Royal S. Meeker, Federal Commissioner of Labor Statistics, has estimated that the minimum required by a family of five is $2,262.

Do the municipal employes of your city receive a living wage?

Personality and Human Beings in Town-Planning Work

By Theodora Kimball

Librarian, School of Landscape Architecture, Harvard University; Honorary Librarian, American City Planning Institute

"SELLING the plan"—we are hearing this new phase in our city and town-planning meetings. It is a good phrase, borrowed from business, where the commodity must be sold to make the business go. And city planners are waking up to the need of turning planning into physical accomplishment by means of the same methods which make for success in salesmanship.

Personality and a real understanding of popular psychology are two of the requisites of the good salesman, as they are equally of the politician, the social worker, the actor, the novelist. The individual is making an appeal to other individuals, and if he gets out of touch with those to whom he appeals, his influence is lost and his work will fail. Likewise, any man who has to secure through public officials, for the benefit of the people they represent, the adoption and financing of a city plan cannot afford to disregard these elements of salesmanship. And although he may be cooperating with other technical men of perhaps more persuasive personality, nevertheless he has his committees to convince, his human problems to understand, and his ideas to get expressed in appealing terms. Where a town is unusually blessed with local selling ability the personality of technicians may be less essential, but their comprehension of individual psychology and of "mass psychology" is still vital.

Many towns need salesmanship combined with technical skill in one man. The passive personality is not the one to "put across" town planning. We need vitality and that quality which seems to have crystallized in the good word "pep." Neither is the man of purely technical interests divorced from their human bases a desirable planner. A genuine social interest, a sympathetic personal knowledge of the wants of human beings—all kinds of human beings—is just as essential to the engineer in town planning as it is to the social reformer. And appreciation of popular habits and desires, and of the points of view involved in the people's own expression of them, is far more necessary to the architect than a Beaux Arts training. Of themselves, strong bridges and beautiful buildings harmoniously grouped have no merit in the city plan. Only as they are properly located and adapted to the needs of those who will use them are they good.

A broad background of real social experience on the part of the town planner makes for a human personality. The ability to express himself by speech or writing in *human* terms is apt to follow. City planning reports need not be dull. They are human documents. Their form of presentation and their illustrations may be such as to catch and hold the attention of the man who is going to live in that city plan. There may need to be two, or even three, editions of a report differently presented to meet technical and popular need. It may not be necessary in some cases to print the full technical report. There should be at any rate a popular printed form, widely circulated. If it can be written by the planner himself, not merely epitomized in catchy terms by someone who does not see parts in terms of the whole, much will be gained.

In engaging a town planner or a committee of experts, a town inevitably considers this question of personality. People are usually chosen who work well together and effectively, also with the local committee. The man who can harmonize apparently conflicting special technical interests while smoothing out local differences and enlisting hearty popular support, is the man who sees widely and deeply and who expresses his personality in human terms. Thomas Adams, of Canada, said at the Cincinnati National Conference on City Planning: "What we need is more red blood." The education of the public to the value of town planning depends upon the humanity and dynamic force of those engaged in the movement.

Protection of Water-Supplies by Sewage Purification

By Harry B. Hommon
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ONE of the most important questions confronting many of our cities today is that of securing and maintaining a water-supply that is free of the organisms of disease and otherwise suitable for domestic and industrial purposes. As our cities grow in size and increase in number the problem becomes more complex, for the reason that the watercourses of the country are used, on one hand, as a source of domestic supply, and on the other, as a means of sewage disposal. It is common practice for a city to take its water from a river at the up-stream side and discharge it below the city as sewage. This dual use of a watercourse has been accepted and recognized by the courts as coming within the rights of the riparian proprietor, but only in so far as the privileges claimed do not conflict with similar rights of others located on the same body of water.

It is not always an easy matter, however, to decide where the rights of one party end and the lawful privileges of another begin. In the past, and to a certain extent at the present time, courts have been called upon to decide controversies arising from the use of streams as a means of disposing of sewage and other wastes. More recently many states have passed laws to regulate stream pollution, and the results have been so satisfactory that it is believed that within a few years all the states will have laws on their statute books which will permit active control over the purity of the watercourses in the country within the boundaries of the states.

One of the most important results that have come from the court decisions handed down and the state laws that have been passed in relation to stream pollution has been the treatment of sewage as a means of protecting water-supplies. It may be of interest in this connection to quote the fundamental principles given by Montgomery and Phelps,* which the courts have recognized as the basis for their decisions:

"The basic rule in common law has been stated to be that each riparian proprietor has the right to have the stream come down to him with its quality unimpaired and with its quantity undiminished.

"But expressions like the above are extreme statements of the rule and cannot be accepted literally.

"That is to say, each riparian proprietor is interested, on the one hand, in having the water come down to him in its natural state and in its full volume. On the other hand, he is interested in making the largest use of the stream which his convenience or interest may dictate; and, since almost any use of the stream has some tendency either to diminish the volume or lessen its purity, or both, it follows that a rule which would preclude each riparian owner from polluting the stream at all or from diminishing its volume at all would defeat its own purpose; and this has been recognized by the courts."

Quoting further from the report referred to above, it is shown that municipalities have no further rights than individuals:

"By the great weight of authority, municipalities have not greater rights than individuals to pollute watercourses and must respond in damages for any injury caused to a lower riparian proprietor and may be enjoined continuing the pollution."

It is thus seen that the courts have recognized the right of an individual, corporation or city to use a watercourse as a means of carrying off its sewage, but only to such an extent that riparian proprietors lower down on the same stream will not be deprived of the natural rights accruing from their vested property rights.

If the water in the rivers and lakes of the thickly settled portions of the country were used only for such purposes as the courts and state laws have held as coming within the riparian proprietary rights, it is doubtful whether these sources would furnish a water satisfactory for domestic purposes without some degree of treatment. Even water-supplies obtained from protected watersheds located in the hills, mountains, or on the headwaters of streams are often sterilized to guard against accidental pollution.

* Stream Pollution: A Digest of Judicial Decisions and a Compilation of Legislation Relating to the Subject. Public Health Bulletin No. 87.

In considering, therefore, the protection of water-supplies by sewage treatment, the important problem is not so much as to whether any given water requires purification, but rather what effect the presence of sewage in unusual amounts will have on the processes of treatment and the character of the water produced. The term sewage is used in the broader sense to include all liquid wastes discharged either from a city's sewers or through outlets from manufacturing plants outside the city limits.

Using the broader meaning of the word sewage, it becomes apparent at once that a city must consider many factors when deciding whether any given stream that contains a large amount of untreated liquid wastes from other communities is a suitable source for a domestic water-supply. These factors will be discussed from the standpoint of the relation they bear to the operation of a purification plant and the quality of water produced.

1 *The bacterial content of the water.* A stream containing comparatively fresh sewage in large amounts will have large numbers of pathogenic organisms, and the potential danger of using such a water, even though filtered and sterilized, may be justification for rejecting the supply or cause for requiring cities or towns up-stream to treat their sewage.

2 *Color.* Rivers or lake waters may contain sewage and colored industrial waste to such an extent that the ordinary purification processes will not remove the color. Dye wastes, tannery, and sulphite wastes from paper manufacturing plants are often discharged into streams in large volumes, and the color imparted to the water persists for long distances.

3 *Alkalinity.* The normal hardness of river water may be so increased by the presence of sewage and industrial wastes that softening processes will be required; or spent acids may be discharged into a river in sufficient amounts to reduce the alkalinity, so that where coagulation is necessary, an additional amount of chemicals will have to be added.

4 *Odors and tastes.* River water may have pronounced odors and tastes due to the presence of some industrial wastes. Those from gas manufacturing and oil refineries are the most common.

5 *Temperature.* Industrial establishments located on small streams may use a large part of the stream flow for cooling and other industrial purposes and thereby raise the temperature of the water of the entire stream. The writer is familiar with one case where the water at the intake of a filtration plant has a temperature of 137° Fahrenheit in the summer time.

6 *The esthetic consideration.* Rivers carrying floating particles common to sewage, such as pieces of fecal matter, soap, matches, paper and other miscellaneous material, does not add to the attractiveness of a water as a source for drinking purposes. No matter how efficient filtration may be, public sentiment is against using water from sources in which direct evidences of sewage pollution can be seen, and it is not necessary that such evidence be in the immediate neighborhood of the water intake.

The extent that the influences noted above will have on any particular water-supply will depend on local conditions. For example, the sewage and industrial wastes from the Pittsburgh District on the upper Ohio River do not interfere with the use of the river water at Cincinnati for domestic purposes, and the presence of these wastes does not place an undue burden on the filtration plant. In this particular case the distance between the two cities on the Ohio River, and the dilution, are sufficient to permit self-purification to take place.

There are, however, many cities and towns located on streams that would furnish suitable water-supplies for domestic purposes if it were not for the fact that the time of flow and dilution of sewage from neighboring communities above are not sufficient for self-purification to take place. In such cases—and there are many of them—sewage treatment should be required, the extent, however, depending upon local conditions. Where the dilution is high but the distance between the point of sewage discharge and water intake is comparatively short, fine screens or some form of tank treatment followed by sterilization may be sufficient. If the dilution and time of flow of sewage discharged into a stream from one city is insufficient to permit self-purification to take place before reaching the water intake of another, complete oxidation in a sewage treatment plant is necessary, and in some cases sterilization will be required in addition. Each problem of sewage disposal is, therefore, a special study in itself, and before plans are prepared a thorough examination should be made to learn what the local requirements are and what design of sewage treatment plant will meet them most satisfactorily.

In water treatment plants it has been possible to adopt standards of purification that are practical, and they are being maintained throughout the country. In sewage treatment, however, the purpose is not to maintain a standard which will apply to

all plants, but rather to so modify the sewage that the natural purifying power of the water in the streams will complete the oxidation of the organic matter remaining in the effluent of the disposal plant. In other words, the effluent from water purification plants must conform to well-defined, uniform standards of quality, while the effluent from sewage treatment plants may be of varying quality depending on the power of the receiving body of diluting water to bring the purification to the required standard.

The science of sewage treatment has progressed to the point where special processes can be recommended for purifying sewage to any degree required. The type of plant best suited for any given city should be determined, however, by a competent sanitary engineer. Enough money should be available for constructing the plant recommended, and provision should be made for the supervision of the operation. The failure of a large number of sewage disposal plants in operation to-day to produce satisfactory effluents is due in a very large measure either to the fact that enough funds were not available to build the treatment plant as large as was recommended by the engineer who designed it, or that it has been outgrown, or that there is a lack of control over the operation. The mistakes that have been made are not inherent in the principle involved, so that cities wishing to purify their sewage for the protection of water-supplies can install and operate properly designed treatment plants with confidence that they will produce the results expected from them.

The question of deciding when one city is discharging more sewage into a stream than its self-purifying powers can take care of before reaching the water intake of another city lower down on the same stream is not always easy to determine. In extreme cases there will be found, on the one hand, situations where the water at the intake of a city will contain direct evidences of sewage pollution such as floating material common to sewage, and, on the other hand, places where the only evidence of sewage that can be found in the water will be the increased numbers of bacteria and an excess of organic matter. Only a very superficial examination need be made in the first case to decide whether sewage treatment is necessary for the protection of a water-supply, but at the other extreme a very careful survey of the entire situation must be made, including chemical and bacteriological examinations of the water that extend over considerable periods of time.

Courts Cannot Accurately Decide on Stream Pollution

Formerly when the courts were called upon to decide the relative merits of controversies arising from questions of stream pollution, the evidence was, naturally, more or less biased by the purpose for which it was to be used. Even where technical evidence was given there was a tendency to omit data which might not advance the interests of clients. From the very fact that the parties to such a suit were interested primarily in winning their case, and because judges and jurymen could not be expected to be familiar with the science of sewage treatment, water purification, and the factors entering into stream pollution, it was not always possible to settle cases on their true merits. There never was, however, any doubt as to the fundamental law regarding the riparian proprietary rights, discussed earlier in this paper, but the evidence was lacking in some cases upon which proper interpretation could be made.

A few years ago it became apparent that the courts were not the proper places to decide whether a stream of water had become so badly polluted with sewage that the water was unfit for domestic purposes. It was felt that the greatest use possible should be made of our watercourses in carrying off the liquid wastes from cities, and that the authority for deciding when a stream had reached its capacity for carrying sewage should be vested in the state. Accordingly, many states enacted laws for controlling stream pollution, and authority for their enforcement has been given to the various state boards of health. For the purpose of carrying out the purpose and intent of these laws, sanitary engineering departments have been developed. These include a chief engineer and assistants, chemists, bacteriologists and laboratory facilities.

It is possible for any state, through such an organization, to keep watch over the streams within its boundaries and to require that they be maintained in a sanitary

condition. When controversies do arise over questions of stream pollution, the states should have the means of collecting the important data by experts and presenting the information in an unbiased manner. Stream pollution cases between individuals and cities, however, ought never to reach the courts in states having a well-organized sanitary engineering department, for the reason that the states should require that corrective measures be applied before conditions reach the point where a lawsuit becomes necessary.

State and National Control of Stream Pollution

Every state department of health should have a competent sanitary engineering department with sufficient personnel and equipment to look after the sanitary condition of all the watercourses within the state. The department will be almost useless, however, if the necessary authority is not given to require that its recommendations be put into effect. The protection of water-supplies by enforcement of sewage treatment is a function of the state acting through its department of health, and the extent to which waterways sanitation is enforced will depend upon the laws passed to require sewage treatment, and the personnel and equipment provided to carry out the work.

The states have jurisdiction over the rivers and lakes within their boundaries, but there is no authority at present to require cities located on interstate streams to treat their sewage for the protection of water-supplies taken from these streams by cities in other states. The industries along our main waterways are sure to increase in size and number, and with them the population will grow apace. The time must come, therefore, when the streams can no longer be utilized, as they are to-day, for carrying off the raw sewage and wastes from large and thickly settled communities, without seriously affecting the use of the water for domestic purposes. The National Government alone has the authority to control the pollution of interstate streams, and it would appear to be in the interest of economy as well as the best interests of future generations for the Government to guard these streams against excessive pollution that may be difficult and expensive to remove if allowed to progress too far. If laws are passed by the Government for the control of sanitation in the interstate streams, they should be closely correlated with the laws of the various states relating to the intrastate streams.

The United States Public Health Service, under authority of an act of Congress passed in August, 1912, has been making a study of the pollution of the interstate rivers, but this law provides only for an investigation of conditions as they exist to-day. It is believed, however, that the data obtained will eventually be used as a basis for framing the necessary laws for preserving the interstate rivers of our country as a safe source of water-supplies for the large cities located on them.

ACKNOWLEDGMENT.—From a paper read at a recent meeting of the Illinois Section of the American Water Works Association.

The Elimination of Electrolysis of Water-Mains

Present Coöperative Investigations Should Mitigate This Trouble

THOSE who were concerned with the operation of either electric railways or water-works in the nineties and the early years of the present century will recall the incredulity and surprise attending the first evidences of stray-current electrolysis, and how this surprise was followed by dismay as increasing numbers of pipes were unearthed showing the ravages of unconfined currents. It was a phenomenon entirely new and unforeseen to engineers, and one for which no effective remedy was known. In those early days the return circuit was not given the attention that it now receives, partly because the importance of the electrolysis problem was not appreciated, partly because of the primitive state of the art of rail bonding, and often because

the earth was intentionally relied upon to carry the return current, assuming that it offered no electrical resistance.

Early Neglect of This Problem

The history of the development of rail bonding is in itself an interesting story, and those who are familiar with it know that the number of types of bonds which have been used is legion. The bonded rail joint has been the weakest link in the return circuit, and until the adoption of the welded joint, now commonly used in the larger cities, was responsible more than any other one thing for the extremely bad electrolysis conditions which existed in many cities. With the improvement of the return circuit through the use of heavier rails, better bonds, welded joints and supplementary feeders, railway loads also increased, and often at a rate far greater than the increase in the return circuit. The result was that with the phenomenal growth of the electric railways, those factors which were not vitally and immediately necessary to the operation of the cars were often slighted or entirely neglected. In not a few instances the electrolysis problem was one of the factors neglected during this early period.

From the very first appearance of electrolysis, nearly thirty years ago, there has been no end of speculation and uncertainty concerning the whole subject. The difficulty of observing the extent and progress of damage on underground structures; the rapidly changing conditions resulting from extensions, improvements and abandoned power stations; the great variations in local condition, as, for example, earth resistance and different types of road-beds, as well as many other factors, all contributed to the difficulty of adequately analyzing and solving the problem.

Many methods of correcting the trouble were proposed and used, but no standard practice has ever been agreed upon in this country other than the maintenance of the return circuit to the highest standard practicable. The cable-owning interests early found that a substantial degree of protection could be secured by draining the sheaths of the cables in areas where they were found to be positive to the earth, to the negative railway bus or to some other point on the return circuit, and this practice has been, and now is, consistently followed. The same method was employed in some cases by the railways and in others by the water and gas companies in an effort to protect the underground piping systems. This method of electrolysis mitigation, known as pipe drainage, though widely used, is in disrepute among many engineers.

Laboratory and Field Investigations

It was because of the wide divergence of opinion and the lack of engineering knowledge on the subject of electrolysis, as exhibited by many requests for information, that the National Bureau of Standards took up a general study of the whole problem in 1910. The first efforts of the Bureau in this field were devoted to a study of some of the more important fundamental principles involved. Laboratory and field investigations were carried out and reports published on many phases of the electrolysis problem. These included: electrolysis in concrete; the laws governing the electrolytic corrosion of iron and lead; earth resistance and its relation to electrolysis of underground structures; leakage resistance of electric railway road-beds; modern practice in the construction and maintenance of rail joints and bonds; and the principal methods that have been proposed for electrolysis mitigation.

Numerous field surveys were also made by the Bureau of Standards, and these have not only formed the basis for a publication on the methods of making electrolysis surveys, but have given an opportunity to experiment with different methods of mitigation. The reports of these various laboratory and field investigations have had a wide distribution and have been very helpful to engineers in bringing about better electrolysis conditions.

American Committee on Electrolysis

In 1913, through the activity of some members of the American Institute of Electrical Engineers, the American Committee on Electrolysis, first known as the Joint National Committee on Electrolysis, was organized, representing the following organizations in addition to that already mentioned: American Electric Railway Association, American Gas Association, American Railway Engineering Association, American Telephone and Telegraph Company, American Water Works Asso-

ciation, National Electric Light Association, Natural Gas Association, National Bureau of Standards. At the second regular meeting of the committee the following statement was made as the reason for its formation and is evidence that the committee was fully aware of conditions as they existed at that time:

"Electrolytic controversies have in the past given rise to unnecessary and acrimonious disputes, and not infrequently have resulted in litigation between the corporations concerned. The usual procedure in disputes of this kind has been for each side to employ one or more electrical experts, who generally disagree as to the cause of the trouble and the remedies therefor. The dispute sometimes gets into the newspapers, occasioning unpleasant notoriety and resulting in more or less drastic municipal action by the city government concerned. Much of this could be avoided if a body such as this committee could be created which would consider broadly the questions covered by the controversy, without attempting to pass upon the questions at issue, but to report back to their respective organizations, so that in time the committee would come to be recognized as a neutral body whose decisions would be authoritative, the same as the Standards Committee of the American Institute of Electrical Engineers in connection with matters of definition and standardization, which is a recognized authority that nobody ever attempts to question. With that end in view, the Institute initiated the movement to organize a national body to consider the general subject and agree upon any basic principles or methods of procedure to be followed in the case of electrolysis disputes."

In 1916 the American Committee printed a preliminary report for submission to its principals under the following general captions:

I. Principles and Definitions
II. Methods of Making Electrolysis Surveys
III. American Practice
IV. European Practice
V. Bibliography

No effort was made to standardize practice or to agree on methods of mitigation.

After the preparation of this report and during the period of the war, the committee was inactive. The Bureau of Standards also, except for making a few surveys, devoted all its activities to military and naval problems for a period of two years or more, so that no material progress in electrolysis mitigation was made during this period.

It thus appears that at the present time, although much valuable research work has been done and the individual utility companies, working independently, have in many cities brought about greatly improved electrolysis conditions, there still remains much difference of opinion as to the applicability of the various methods of mitigation, and the conditions described in 1914 at the organization of this Joint Committee and which the committee was formed to correct, are, in large measure, still prevalent.

Coöperation in Settling Controversies

With the revival of activities a year ago, the American Committee on Electrolysis appointed a sub-committee, known as the Research Sub-Committee, to conduct investigations into controversial questions in electrolysis in coöperation with the Bureau of Standards. The one subject more than any other upon which engineers have disagreed and which has stood in the way of progress is that of pipe drainage. In spite of the wide application of this principle, there is much difference of opinion as to the extent to which it should be used. A number of questions, as, for example, joint electrolysis at high resistance pipe joints, interchange of current between unequally drained systems, and gas explosions on heavily drained pipes, can be settled only by comprehensive study in the field, in cooperation with the local pipe-owning companies.

The Research Sub-Committee and the Bureau of Standards are accordingly attacking these problems and are receiving the cordial support of a number of water and gas companies.

With the street railway, the pipe-owning companies and municipalities and the lead cable interests all working together in harmony, assisted by the Bureau of Standards, a neutral body, conditions are most favorable for determining the facts relating to electrolysis. It is only by coöperation of this nature that complex problems involving the welfare of so many interests can be adequately dealt with. With this arrangement for coöperation it is not unreasonable to hope that ultimately the American Committee on Electrolysis will be able to report definitely on all methods of mitigation, describing the advantages and limitations of each, and so far as possible to recommend suitable standards of practice.

Where Public Schools and Playgrounds Have Joined Forces to Utilize the Play Instinct

The Recreation Program of Oakland, Calif.

By Chester Geppert Wallis

THE playground movement in America, although yet in its infancy, has fulfilled such a big need, has been so immediately productive of results in character building and physical development of the nation's youth that it has grown by leaps and bounds. So big is the vision back of the movement, so widespread the influence of the leisure hour program, so many points of contact are made, that it is safe to say that at last a big common ground has been found wherein lies the real democracy of the future.

In no city where playgrounds have been established has there been a more successful working out of the play ideal than in Oakland, Calif., where the playgrounds and the public schools have joined forces in utilizing the play instinct as an educational asset and in bringing practically every child in the city in touch with the wholesome influence of the play program.

In 1914 a committee was appointed for the purpose of evolving a plan whereby the Board of Education and the Board of Playground Directors might coördinate their efforts, make public playgrounds of the school yards, make community houses of the school buildings and dovetail the educational program of the school and the playground in such a way that where the school teacher leaves off, the playground director takes up the work, and vice versa.

The Framework of the Plan

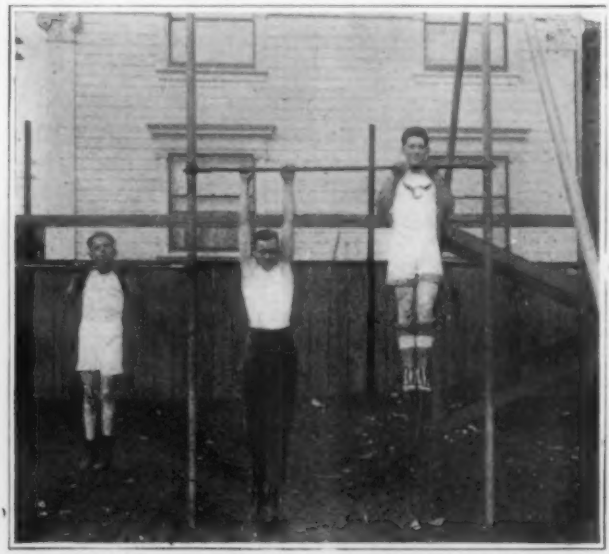
The following report was submitted by this committee to the two boards and the plan immediately put into execution:

1. That the Board of Playground Directors of the city of Oakland be given the general control and supervision of the play activities, including the appointment and control of playground teachers and the equipment of the elementary school playgrounds outside of school hours.

2. That wherever practicable this supervision be exercised in behalf of adults as well as school children and include all school athletics, games, plays, dancing, evening recreation centers in school buildings, exclusive of the needs of the School Department, shower baths, dressing rooms, playground supply room, pageants and festivals.

3. That the Superintendent of Recreation of the city of Oakland be made ex-officio Director of School Playgrounds and Physical Education.

4. That the expense of equipment, maintenance and instruction for the school playgrounds be



THE PULL UP IN THE OAKLAND BOYS' DECATHLON

borne equally by the Board of Education and the Board of Playground Directors of the city of Oakland.

5. That the relation of the Superintendent of School Playgrounds to the school principal shall be the same as that of other assistants of the Superintendent of Schools.

6. That the school principal shall be responsible for the school playground and for the conduct of the playground supervisors when he is present; and that the playground supervisors shall be responsible to him when he is in charge of the school.

7. That copies of all rules and regulations governing school yard playgrounds or recreation centers or playground supervisors shall be furnished to school principals.

8. The Superintendent of Playgrounds has full control over athletics and play activities outside of school hours, and of physical education activities during school hours.

Aside from the ethical value of this program, there ensued a great economic saving to the city in the subsequent purchase and equipment of ground. A large district known as East Oakland was annexed to the city at about this time, and in planning the park, school, and playground areas these were combined, and large tracts and athletic fields, some as large as 17 acres, were purchased adjacent to the school buildings and equipped as playgrounds. The expense of surfacing, equipping and maintaining these school playgrounds is met by the Board of Education, while the park playgrounds and Lake Merritt are maintained by the Recreation Department. This arrangement gives the city 51 public playgrounds, 41 being school grounds and 10 park playgrounds, including Lake Merritt, the city's great water playground and recreation center.

To carry out this joint program, the services were obtained of a man who had successfully worked out in one of the public high schools a program of athletics that was in a small way a practical demonstration of the new plan. This man, Jay B. Nash, later became Superintendent of Recreation, in which position he has been able to carry out his early ideals to their fullest.

PRACTICING THE SIT UP

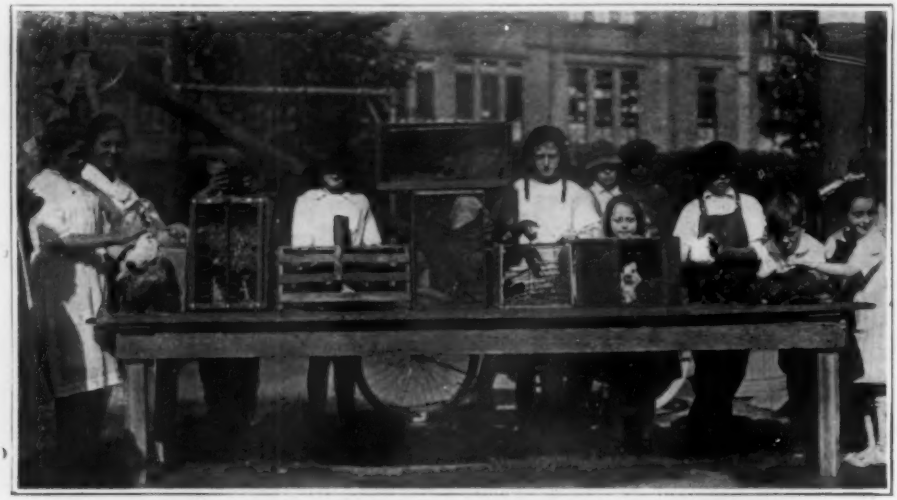
The Decathlon

The Fremont plan of athletics, so called from the name of the high school where the experiment was made, was a forerunner of the general policy adopted by the Recreation Department of Oakland and later by the entire state. Physical education became a part of the school curriculum, and credits were given for the work in athletics. Team games were resolved into their elementary movements, which exercises replaced the more formal gymnastics of the turnverein type. These exercises became a continuation of the study of physiology and hygiene and were later put into effect on the playgrounds in actual play.

Borrowing from the comprehensive program of the ancient Greeks in physical training, a Decathlon, or series of ten events, was prepared to serve as the basis for the teaching periods during school hours. These events served as a means of scoring the skill and development of the children and of preparing them to take part intelligently in the team games on the playgrounds at recess and after school hours.

These events are:

BOYS	GIRLS
1. Pull up (chinning)	1. Traveling rings or pull up
2. Soccer kick for goal	2. Hockey goal shoot
3. Basket-ball throw for distance	3. Basket-ball throw for distance
4. Basket-ball throw for goal	4. Basket-ball throw for goal
5. Running broad jump	5. Volley ball serve
6. Running high jump	6. Jump and reach
7. Dash	7. Dash
8. Baseball throw for accuracy	8. Baseball throw for accuracy
9. Push up	9. Push up
10. Sit up	10. Sit up



SOME OF THE ENTRIES IN THE OAKLAND PLAYGROUND PET SHOW

The results of the Decathlon have been tremendous, and there are few children in the public schools of Oakland who are not proficient and enthusiastic athletes. Where the elementary movements of a game have been taught as part of the school class work, it is found that children are not so timid about joining in the team play. Those underdeveloped boys and girls who need the exercise most, who formerly lost out by their timidity and lack of ability, are now ready to take their places in the lists by reason of previous training.

The annual track meets, in which all schools in the city participate, show a steady increase in physical development, posture and number of entries. The spring meet for 1920 was a wonderfully inspiring sight that testified to the success of a standardized course of physical instruction. There were more than six thousand entries, requiring three hundred officials to run off the various events.

To provide a similar opportunity for a general athletic meet for the girls, a play day is held in the fall, in which the same steady growth in numbers and development is apparent. The play day program includes folk dancing, circle and singing games, matched games and athletic contests and the presentation of short plays by the various dramatic clubs.

As a direct result of the tying up of the efforts of school and playground boards, a state law was passed in 1917 making physical education a compulsory part of the educational system. In order to facilitate the inauguration of the plan, Mr. Nash was made Assistant State Superintendent of Physical Education. He held this position long enough to see the Decathlon installed in every school in the state, after which he returned to give his entire attention to the broader community needs of recreation work.

The Decathlon program is so constituted that it meets the needs of the rural schools with poorly equipped grounds as well as those of the more pretentious city grounds, as it requires a minimum of material and equipment.

The Annual Pet Show

Among other phases of the play education of the Oakland Recreation Department which engage the attention of the children during the year, culminating in an annual event, is the playground pet show, held at the beginning of the school year at one of the larger park playgrounds.

There are few children who do not pin their affections upon some bit of animal life, and the entries are numerous and varied, ranging from baby chicks to ponies. Because of the latitude given in the classification of entries, it is necessary to have many blue ribbons to bestow upon the winners, as many of them are in a class by themselves—for instance, the quackless duck and the bob-tailed kitten entered in the last show.

Water Waste and How to Prevent It

By P. H. Beauvais
City Manager, Manistee, Mich.

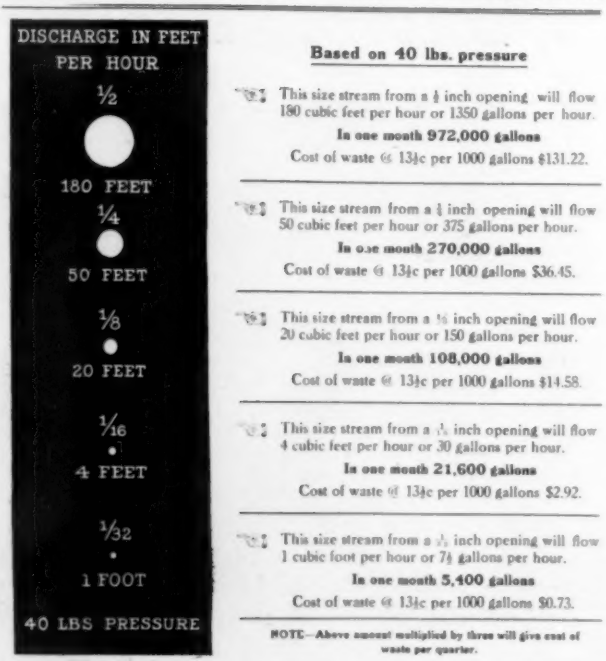
THERE is probably no greater problem to be solved by the Superintendent of a Water Department than that of water waste. The immense value of metered service as a stepping-stone to waste elimination has been quickly realized by the majority of water superintendents, and, wherever possible, depending to a large extent upon the funds on hand, services being metered and wastage reduced.

But then comes the excess on metered services, and where is the water collection clerk that does not dread water collection time and the vast number of complaints he receives due to an excess over the minimum amount allowed?

In Manistee, in the third quarter of 1919, out of 1,300 metered services 650 showed an excess, and 12 per cent of the extra charges were due to leaks in fixtures, and ranged from $4 to $70 on ⅝-inch meters. Some of the causes of the excesses were leaky closets, leaky faucets, sill-cocks and garden hose not completely turned off.

When services are metered, these leaks are readily found, which is a good argument in favor of metered services, but in the case of unmetered service where a flat rate is given, the problem of finding the leaks and having them repaired is more complex. To remedy this difficulty we have instituted systematic fixture inspections on all flat-rate consumers, and compulsory repairing of imperfect or leaky fixtures. Sufficient time has not yet elapsed to show what results have been attained, but it is safe to say that some good must come of it.

The circular reproduced is one of a number used to educate the public to the necessity of repairing leaks, no matter how small, and to do so promptly. The average consumer has no conception of the amount of water that will pass thru a small orifice in a certain length of time, and these charts are a revelation to most water users.

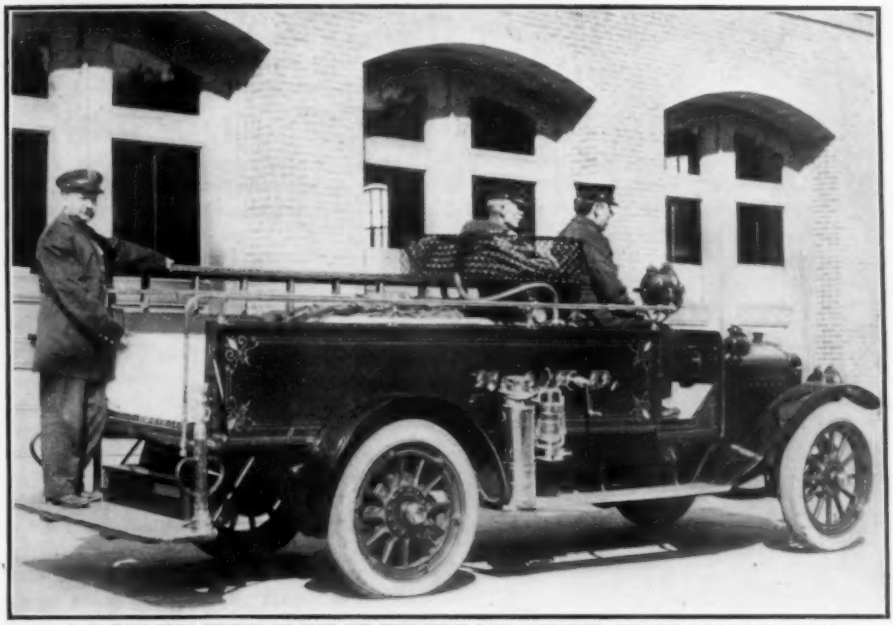

How Water is Wasted
DISCHARGE IN FEET PER HOUR
½
180 FEET
¼
50 FEET
⅛
20 FEET
1/16
4 FEET
1/32
1 FOOT
40 LBS PRESSURE
Based on 40 lbs. pressure
This size stream from a ½ inch opening will flow 180 cubic feet per hour or 1350 gallons per hour.
In one month 972,000 gallons
Cost of waste @ 13½c per 1000 gallons $131.22.
This size stream from a ¼ inch opening will flow 50 cubic feet per hour or 375 gallons per hour.
In one month 270,000 gallons
Cost of waste @ 13½c per 1000 gallons $36.45.
This size stream from a ⅛ inch opening will flow 20 cubic feet per hour or 150 gallons per hour.
In one month 108,000 gallons
Cost of waste @ 13½c per 1000 gallons $14.58.
This size stream from a 1/16 inch opening will flow 4 cubic feet per hour or 30 gallons per hour.
In one month 21,600 gallons
Cost of waste @ 13½c per 1000 gallons $2.92.
This size stream from a 1/32 inch opening will flow 1 cubic foot per hour or 7½ gallons per hour.
In one month 5,400 gallons
Cost of waste @ 13½c per 1000 gallons $0.73.
NOTE—Above amount multiplied by three will give cost of waste per quarter.
Issued by the Manistee Water Dept. for the enlightenment of consumers and to prevent waste. WATCH YOUR WATER SYSTEM for leaks and have them repaired. When you have an excess do not blame the Water Department. You may have a leak.

PART OF A CIRCULAR WHICH PROVED VERY HELPFUL IN MINIMIZING WATER WASTE IN MANISTEE

Municipal and County Motor Trucks That Furnish Valuable Service

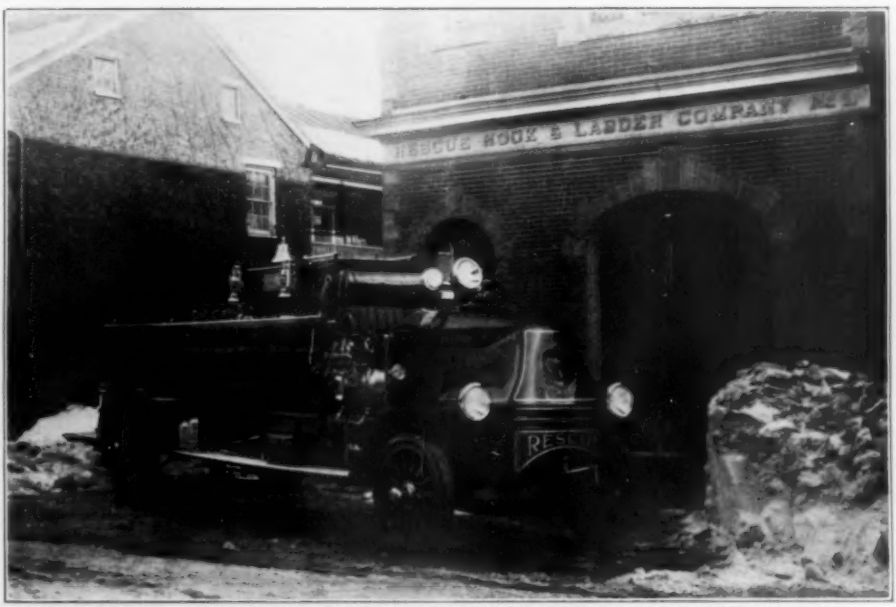
LA PORTE COUNTY, IND., OWNS AND OPERATES SEVEN OF THESE ACME TRUCKS

A SERVICE TRUCK IN ALL-YEAR WORK IN THE FULTON SPECIAL ROAD DISTRICT, MISSOURI



A ¾-TON GMC TRUCK IN USE BY THE FIRE DEPARTMENT, NORTH ANDOVER, MASS.

Municipalities are rapidly discovering the utility of the motor truck for the many and varied uses for which city officials need haulage units. They are finding that one motor truck will do the work of from three to five teams—and do it more speedily and economically. In hauling away the refuse of street, alley or sewer; in carrying sand, gravel and other materials for street repair or construction; in fact, in any of the many departments of city service work, the motor truck has found a permanent place, to the benefit of the city at large and the taxpayer in particular.



AN EFFECTIVE PIECE OF MACK FIRE APPARATUS IN SERVICE AT MECHANICSBURG, PA.

A New Field for the Development of Fire Prevention

Many Reasons Why Local Fire Insurance Agents Should Lend Their Aid to Fire Chiefs

By John G. Gamber
State Fire Marshal, Illinois

ANY new effort, or any extension in the scope of any work, must be justified by some outstanding need. This subject then divides itself into two parts: First, what is the need for development of new fields of fire prevention activities? Second, what are the fields which must be developed to meet that need?

What Do Fires Cost?

The writer has been paying considerable attention to the local fire problems of various Illinois cities, and has become impressed with the fact that the annual fire loss—great as it is and calling for every possible fire prevention effort—is but a small part of the cost of fires from a community economic standpoint. This fact has been brought out forcibly in the last few months, when some of our cities, because of the high cost of wages and commodities of every sort, have been obliged to curtail their fire-fighting forces and equipment in order to keep within their revenues.

The problems in Illinois are similar to those of cities in other states. Millions of dollars are invested in fire stations and equipment in American cities. Millions more are expended annually for maintenance. If anything like the actual fire cost to American cities is to be determined, these items of investment and maintenance must be considered.

With the purpose of getting an idea of this cost to representative American cities, a letter was written recently to the fire chief of the largest city in each state, asking him to fill out a blank with the following data:

Amount of money invested in buildings, ground and equipment
Total cost of maintenance in 1918
Total fire loss for 1918

The letter asked also for considerable detailed information along these lines. Practically complete information was secured from 42 cities, while all but one of the remainder furnished partial information.

The figures were tabulated and, using estimates of population furnished by local chiefs, the cost of the investment, cost of maintenance and total fire loss were reduced to a per capita basis. By adding together these three per capita costs, a very good idea of what fires cost these cities last year was secured. Before reducing the cost of maintenance to the per capita basis, interest on the investment at 5 per cent was added, as this is properly an item of the annual cost of maintenance. No effort was made to figure depreciation, since replacements are made annually out of general taxation and show in the cost of upkeep.

The showings from a few of the larger cities are cited herewith. Let us take first the leading mid-western city, Chicago. Chief O'Connor estimated the population at 2,700,000. The Chicago Fire Department represents an investment of $4,540,268, or $1.68 per capita. It cost Chicago in 1918 for maintenance $3,238,318. Add interest on the investment at 5 per cent, amounting to the neat little sum of $227,013, and we have the real cost of maintenance—$3,938,518, or $1.45 per capita. Chicago's fire loss in 1918 was $3,462,577, or $1.28 per capita. By adding these three per capita costs together we find that fires cost Chicago in 1918 $4.41 for every man, woman and child of its almost 3,000,000 population.

But Chicago's cost by comparison was very moderate. Take a Pacific Coast city, Seattle, Wash. Seattle has a population of 426,000. Here are the figures: total investment, $1,460,332, per capita $3.42; cost of maintenance in 1918 plus interest on investment, $1,026,490, per capita $2.40; fire loss in 1918, $1,809,000, per capita $4.24; total cost, $10.06 per capita.

Take an example from the eastern sea-

board, Newark, N. J., with a population of 425,000. The investment was $1,443,075, or a per capita of $3.39; the cost of maintenance in 1918, plus interest on the investment, was $1,284,210, or a per capita of $3.02; the fire loss in 1918 was $2,549,468, or a per capita of $5.99, making the total per capita cost $12.40.

Just one more example, this time from the South. Dallas, Tex., has a population of 130,000. Its investment is $618,775, or a per capita of $4.75. The cost of maintenance in 1918, plus interest on the investment, was $340,938, or a per capita of $2.62. The 1918 fire loss was $750,468, or a per capita of $5.77. The total per capita cost reached the figure of $13.14.

Further illustrations need not be cited. The following summary gives a concrete idea of how expensive fires and fire protection are to most of our cities:

Of the 42 cities from which complete figures were obtained, all but one had a per capita cost of more than $3 on the basis outlined above. In 38 cities the figure exceeds $4; in 31 it was more than $5; in 25 it was in excess of $6; in 18 it was more than $7. Fourteen cities paid a bill of more than $8. In 11 the toll exceeded $9; in 8 it was more than $10; in 6 it was in excess of $12; in 3 it was more than $13; while in 1 the cost passed the $14 mark. The only city with a per capita cost of less than $3 was Albuquerque, N. Mex., which had the remarkably low figure of $1.73. Memphis, Tenn., was at the other extreme with the exceptionally high figure of $17.13.

It might be interesting in passing to note that the salaries of firemen alone amount to more than $1 per capita in three-fourths of the cities in this list. It also should be borne in mind that the figures cited represent costs in 1918. Since then there have been increases of at least 35 to 50 per cent.

Add the Cost of Fire Insurance

It occurred to the writer that it might also be interesting to know, in connection with these figures, what fire protection is costing us from another angle—the insurance cost. Figures were obtained as to the aggregate premium collected by fire insurance companies in 1918 from the insurance departments of 36 states. These were reduced to a per capita basis by use of the latest population estimates of the Federal Census Bureau for the various states. It was found that the cost of insurance protection last year ranged from $2.18 per capita in New Mexico to $13.38 in Rhode Island.

Let us consider the results of these two investigations in conjunction. Add to the per capita investment and maintenance cost of any city fire department the per capita insurance premium cost of the state in which that city is located, since it is the insurance premiums which pay the losses. This gives a very fair and forcible idea of what protection against fires and protection against losses are costing.

But, from whatever angle you look at the figures, the inference is the same: *the cost of having fires in American cities is altogether unreasonable and exorbitant.* The conclusion must inevitably be reached that there is a pressing need for development of new fields for fire prevention and that these fields are especially the opportunity and responsibility of local community forces.

The Responsibility of the Local Insurance Agent

There is a field which has been scarcely touched, a field with most fruitful possibilities for development—that which is occupied by the local agents of the insurance companies. Here are men particularly suited for this great work by the position they occupy and by their responsibility both to their companies and to the public. What a potent force they could be in every community!

Considering the local agent first from the viewpoint of his duty to his company, since that, of course, is his first duty: if he owes the company anything, it is to see that its interests are protected as fully as possible on every risk he writes. This takes in both the moral and the physical aspects of the risk.

Consider for a moment the moral risk. Over-insurance is the forerunner of the crime in the case of the professional arsonist, and the temptation to commit the crime in the case of the unscrupulous non-professional. If the over-insurance evil could be eliminated, fraudulent fires would be reduced to a minimum. No one is in such favorable position to check this evil as the local agent.

It would seem, then, to be the first duty

of the agent to see that values are as represented on every risk he is asked to write. He should inspect the risk as a matter of sound business practice. Through some sort of follow-up system, he should keep posted on his more important risks, so as to know whether the values are being kept up or are depreciating. Especially should he be on guard for the professional arsonist, who makes a showing of values on prosperity just long enough to secure a policy.

There are doubtless many good agents who make earnest efforts along this line, but too often we find that the sole aim of the agent seems to be to write as large a policy as possible in order to increase his commission on the premium, with the quality of the risk his second consideration. This, of course, is playing right into the hands of the crook. And, worse still, it sometimes happens that it is the local agent who makes the loudest protest when payment of a claim is held up, pending investigation by the Fire Marshal, doubtless because his obsession regarding prompt settlements for advertising purposes overcomes his sense of discrimination.

If it is important to inspect risks as to values, it is doubly important to inspect them as to physical condition. The loss due to incendiary fires, while large, is but a small percentage of the total fire loss. Probably 90 per cent of the total fire loss is due to natural causes, and a large part of it is directly attributable to physical hazards which should not exist.

The writer believes it the duty of every agent to reject every risk where flagrant hazardous conditions are found, withholding the policy until conditions are remedied. He should penalize every special hazard with the extra charge, where the extra charge is provided, and not wink at these special hazards, as some agents are inclined to do.

The agent should keep in mind also the need of reinspection when policies are renewed and, in certain cases, at other times. Take the case of buildings which once were ideal residence properties but which, through industrial or social transitions in the districts in which they are located, have become deteriorated and in many cases vacant and the rendezvous of tramps. They are the worst sort of hazards and are continually the scene of fires. In many cases investigations reveal that insurance is in force for the full original amounts. It is needless to say that with this temptation always before a property owner who has permanently depreciated values on his hands, not all these fires are accidental. If the agent had kept fully informed as to these risks and had taken the proper action, the policies would have been canceled long since. But in too many instances he has not only failed to do this, but has actually written new policies on buildings which are scarcely more than shacks and which no company would carry if apprised of true conditions.

Finally, because he is in the insurance business, the agent has a duty to the public, since it is the public which pays the premiums which sustain the losses. He should find out whether their local building codes and electric wiring ordinances are as effective as they should be, whether there are ordinances requiring the removal of rubbish and débris, and whether the ordinances are being lived up to. If the ordinances are not adequate or are not being complied with, he should strive to have them made adequate and enforced. He should be the leader in fire prevention and clean-up day campaigns in his community, working constantly for the education of the people along more advanced lines of fire prevention and protection.

The Chamber of Commerce an Effective Ally

Organized effort, of course, is necessary to accomplish much along these lines. In the larger communities the organization machinery is already at hand in the chamber of commerce. Made up of the most substantial and influential interests of the city and dedicated to the advancement of the civic welfare, it is the most potent force in any community. If its governing board is apprised of the need for fire prevention activities, what they will mean to the city, and how to go about getting practical results, an effective program will be in operation in short order.

The progressive local insurance agent is always identified with his chamber of commerce. His advice would be heeded and his leadership accepted as in the case of other interests which are alive to the opportunity of advancement through community effort.

News and Ideas for Commercial and Civic Organizations

New Membership-Getting Plan Stimulates Civic Spirit

PONTIAC, MICH.—A brand-new method of securing members has been discovered by the Pontiac Board of Commerce. What is called the "In and Out" Club, composed of but five members, has been formed for the purpose of getting members for the Board of Commerce. The personnel of the Club is constantly changing because the individual ceases to be a member as soon as he has secured his new member. "Get Kicked Out" is the Club slogan.

There is a strict ruling which provides that "if any member of the Club fails to secure one new member for the Board in a month, he must get two the following month, and three the third month, and so on, until he has filled the requirements." There can be no loafing on the job, therefore. The man who does not get his member inside of a month is to be pitied; there are too many who will censure him for his lack of civic spirit to permit such a thing to happen. The member who has earned the right to be dismissed from the "In and Out" Club becomes automatically a member of the "Live Wires" Club, an organization which so far is purely honorary. Its members are provided with a "Live Wire" badge.

The rapidity with which things have been moving in the "In and Out" Club is shown by the fact that Frank Anderson, the original captain of the club, was in it just six hours. He had secured his first member before evening. The Club rules provide that each member appoint his successor. Mr. Anderson appointed G. S. Shaffner to solicit one member. In twenty hours Shaffner had his new member. Mayor Ely was a member of the Club but three seconds, and holds the record. The fact that twenty-four new members were secured during April indicates that the new club idea is worth trying.

The "In and Out" Club replaces the old-style membership committee appointed each year for the purpose of securing new members. The "In and Out" Club was created in Pontiac to do the work in a better way than had been done by the standing membership committee.

C. W. OTTO,
Managing Director, Pontiac Board of Commerce.

"Colonized" Luncheon and Forum Meetings

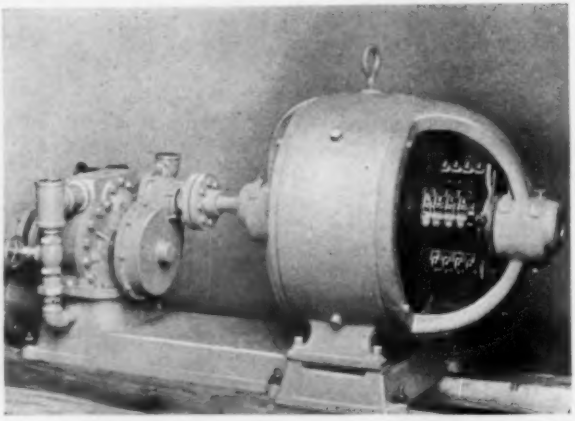
BILLINGS, MONT.—The Billings Commercial Club has discovered a way of stimulating interest in the weekly forum luncheons held in the Club's dining-room. The new method is working out very satisfactorily to the House Committee with which it originated.

The Club's membership is made up largely of business and professional men who came from eastern and southern states a comparatively few years ago, for Billings has grown from a frontier town of a few inhabitants in 1882 to a modern city of approximately 20,000 people. The members have been "colonized," that is, grouped together according to the states from which they came, and each colony divides the honors in planning the forum program, and even the menu each week. The men in the Missouri colony advertised themselves as from the "Show Me" state, and asked the question, "Why Billings?" Five-minute talks presenting the city's advantages and disadvantages were given, many of which contained really valuable ideas and suggestions. The Missourians arranged with the Club caterer to make corn bread and sweet potatoes the principal features of the menu.

Other "colonies" have handled the forum and luncheon meetings with equal success. The idea has been "sold" to Billings and the membership. The local papers have given it much good publicity and encouragement.

FRED T. LINCOLN,
Secretary-Manager, Billings Commercial Club.

NORTHERN ROTARY PUMPS



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¶ Will deliver more gallons per minute per horsepower than any other pump.

¶ There are over three hundred Users of Northern Rotary Pumps who will testify to this fact.

¶ The Northern Rotary Pump can be furnished to fit any truck for fire service—on hand drawn trucks as electrically or gasoline driven units—as stationary units with electric or gasoline motors for fire or water works service.

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NORTHERN FIRE APPARATUS CO.

MINNEAPOLIS, MINNESOTA

MANUFACTURERS OF THE NORTHERN TRAILERPUMP FOR FIRE SERVICE

Million-Dollar Civic Fund Raised by Middletown Chamber

MIDDLETOWN, OHIO.—On the evening of March 31 the campaign which the Middletown Chamber of Commerce had been promoting to raise $1,000,000 for civic improvements closed with a total subscription of $1,030,000 and 9,000 contributors. This accomplishment is believed to be unprecedented in a city of 25,000 people. It indicates a per capita contribution of $40, and estimating that there are 5,000 homes in Middletown, it means an average of $200 contributed by each home.

The improvements for which this civic fund makes provision are:

1. Additions to the Middletown Hospital
2. Financial assistance to the Board of Education for increased pay for its teachers
3. An extension of the present system of parks and playgrounds
4. More commodious quarters for the Girls' Club
5. Financial assistance to the Public Library
6. The erection of a Community Memorial Building, to be dedicated to the soldiers, sailors and marines who served in the World War
7. Headquarters in the Community Memorial Building for the local post of The American Legion
8. A new Y. M. C. A. building
9. Financial assistance to the City Commission, pending the proposed remedial legislation affecting taxation
10. Financial assistance from time to time for other community development activities which shall be designated by the Civic Fund Campaign Executive Committee

The greater portion of this fund was raised by the pledge system. Two forms of pledge cards were issued, one a salmon-colored card, which was distributed in large quantities at the manufacturing establishments and other places where large numbers of people were employed, and the other, a smaller white card, used elsewhere. The ten subjects for which the Civic Fund was created were given on both cards. The individual pledged to pay into the fund a certain amount weekly, semi-monthly, or monthly. An illustrated booklet entitled "Men Are Square," outlining the plan for community helpfulness, was issued, together with a leaflet containing the answers to questions that were likely to be asked regarding the fund. And there were buttons and badges, and posters for the windows and for wind-shields on automobiles. All bore the same design, which is reproduced below.

LOOKING TOWARD THE DAWN OF A BETTER DAY FOR MIDDLETOWN

The various aims and ideals of the Greater Middletown Plan were largely developed by George M. Verity, president of the American Rolling Mills Company, who is chairman of the Civic Fund Executive Committee of seventeen members. The Secretary-Manager of the Chamber of Commerce was campaign manager. The Civic Fund Campaign Committees had over ninety members, and each industrial establishment had its own campaign organization and chairman. There was also a Woman's Team Organization, which was organized by wards, each with its chairman. The soliciting teams were composed of 500 workers.

While raising a million dollars is considered a worth-while achievement, the sponsors of the plan consider that of secondary importance to the spirit of co-operation which the campaign has produced in the community. It is impossible to over-estimate the high quality of the spirit now existing in this city. It has inspired the people with such faith in the community's ability to rise to the occasion that the Chamber feels that it can safely undertake any sound program of civic development, however ambitious it may be.

DWIGHT E. SMITH,
Secretary-Manager, Middletown Chamber of Commerce.

Otterson Auto-Eductor Cleans Catch Basins

Saves Time-Money-Labor

The Otterson Auto-Eductors are saving thousands of dollars yearly to the following cities now using them:—

Seattle, Wash., 1 machine
Portland, Ore., 1 machine
San Francisco, Cal., 1 machine
Chicago, Ill., 1 machine
Chicago, Ill., repeat order, 6 machines
Chicago Park Board, 1 machine
Milwaukee, Wis., 2 machines
Milwaukee, Wis., repeat order, 2 machines
Indianapolis, Ind., 1 machine
Indianapolis, Ind., repeat order, 1 machine
Louisville, Ky., 1 machine
Louisville, Ky., repeat order, 1 machine
Akron, Ohio, 1 machine
Albany, N. Y., 1 machine
Brooklyn, N. Y., 1 machine
New Bedford, Mass., 1 machine
Providence, R. I., 1 machine
Providence, R. I., repeat order, 1 machine
Richmond, Va., 1 machine
Bridgeport, Conn., 1 machine
Halifax, N. S., 1 machine

U. S. Army Camps:
Camp Meade
Camp Gordon
Camp Lee
Honolulu, H. I.

Efficient, economical and sanitary in operation. Cleans catch basins in from four to twenty minutes:

Equipment mounted on any 5-TON Chassis of suitable standard make.

THE OTTERSON AUTO-EDUCTOR CO.

817 FAIRBANKS BLDG. **SPRINGFIELD, OHIO.**

Inadequate Municipal Revenue Presents Serious Problem

NEW CASTLE, PA.—Municipalities generally throughout the United States are seriously embarrassed at the present time by an insufficiency of revenue. This is due to the sudden increase in operating expenses, which, in turn, is due to the rise in the cost of materials and the price of labor. The deficiency prevails in both city and school districts, with the result that municipalities have been obliged to curtail or postpone necessary public improvements. The educational systems, too, have been seriously handicapped from lack of funds.

New Castle is no exception to the rule, and the Board of Trade is endeavoring to meet the situation here through its Committee on Taxation. This committee evolved a plan for assessing all the real estate of New Castle for its "fair sale value." The recommendation had the approval of the directors of the Board of Trade and has been adopted by the city government. The new assessment is being made upon the basis of a 100 per cent valuation. This will go a long way toward accomplishing an equalization in assessment upon an equitable basis, and will immediately increase the realty valuations in New Castle from $27,000,000 to approximately $50,000,000 or $60,000,000. The millage will be reduced, but the higher valuation will enable the city to levy an assessment that will produce operating revenues sufficient to meet its requirements, and at the same time provide a basis of credit for additional municipal bonds as they may be required for improvement projects.

The recently published report of the United States Bureau of the Census entitled "Financial Statistics of Cities," covering the year 1918, shows that 60 of the 96 cities in group No. 5 whose populations range from 30,000 to 50,000 report deficits in their municipal revenues. In group No. 4, made up of cities having populations of 50,000 to 100,000, 43 cities out of a total of 62 report municipal deficits; while in groups Nos. 1, 2, and 3, including all cities having populations in excess of 100,000, 43 cities out of the 69 were obliged to spend more for operations than was received from all sources, including taxes, special assessments, fines, earnings of general departments, rents, privileges, interest and earnings of publicly-owned utilities. In other words, 147 of these 227 American cities have been obliged to spend more for operations than they have received from taxation and other sources of revenue.

This condition is one that calls for action by commercial bodies, as the taxing officers are usually reluctant to increase the public burden unless assured that they will be sustained by public sentiment. Likewise, the taxpayers are slow to take the initiative when the question of increasing taxes is presented. In many instances such movements have met with very determined opposition, and, at best, it is a slow and cumbersome proceeding to revise a system of valuations.

The fundamental requisite in any program of municipal improvements is provision for revenues. An adequate system for the assessment of property for taxation should insure not only a sufficient income for operations, but the standard of valuations should be so established as to provide a legal basis of credit for the issue of bonds that may be required to finance improvement projects.

An examination of the programs of work of a considerable number of representative chambers of commerce shows that a very large percentage of the projects in which these organizations are interested come within the class of improvements at the expense of the city and the county. Does it not follow, then, that the outstanding project of importance in many of our chambers of commerce is to deal promptly and effectively with the question of taxation?

JOSEPH W. KENNEY,
Commissioner, New Castle Board of Trade.

Lake Michigan Made Accessible to Manisteeans

MANISTEE, MICH.—The map shows that Manistee is located on the eastern shore of Lake Michigan. The lake shore is the city's western boundary. From their residence or office windows, hundreds of residents can see the waters of the lake rolling majestically, but until the Board of Commerce took hold of the matter recently, Manistee had no access to the lake except a narrow cinder roadway running along the north side of the Manistee River to the Coast Guard Station.

The entire short line in the vicinity of Manistee consists of a series of most pic-

MUELLER
Sanitary Drinking Fountains

There is a MUELLER model to meet every need. The three designs here shown—E-3650, E-3758 and E-3632—are all popular styles for parks and public buildings.

Each MUELLER Fountain combines the most approved sanitary construction with beauty of design and quality of materials and manufacture. We are equipped to supply special fountains for unusual conditions.

Write for full information and prices.
Mail orders given prompt attention.

H. MUELLER MFG. CO., DECATUR, ILLINOIS U. S. A.

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Water, Plumbing and Gas Brass Goods and Tools

New York City, 145 W. 30th St.
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Sarnia, Ontario, Canada

Mueller Metals Co., Pt. Huron, Mich., Makers of Red Tip Brass and Copper Rod and Tubing; Forgings and Castings in Brass, Bronze and Aluminum; also Screw Machined Products.

turesque dunes, overgrown with evergreens and hardwoods and native shrubs. The beach is ideal for bathing. Years ago a railroad purchased all the lake front for terminal facilities and yard room. The yards were never put in, and the dune country has been preserved in all its pristine beauty.

Believing that the people of Manistee should have access to the lake on the south side of the Manistee River, where most of the city lies, the Board of Commerce took the matter up with the owners of the railroad property and, after negotiation, secured title to a 66-foot street to run three-fourths of a mile to the lake. The matter was next taken up with the City Commission, with the result that the city has put in a permanent asphalt pavement to the lake.

A large resort development is now being projected and has reached a definite stage. It is expected that within two years property now listed on the tax rolls at a nominal value will be paying the city in taxes more than 25 per cent annually of the cost of the improvements to be made, and the people of this city will have the inestimable boon of being able to reach the great lake that rolls at their doors.

J. C. BEUKEMA,
Secretary, Manistee Board of Commerce.

A Road and Travel Bureau

MADISON, WIS.—The Road and Travel Bureau of the Madison Association of Commerce was instituted two years ago to serve not only the many tourists who come to the city, but the citizens themselves who desired to take trips to various parts of the country. Maps and other data were secured from state highway commissions, showing the main routes through the various states, as well as many of the provinces of Canada. Maps of cities and the great transcontinental routes were likewise obtained, as well as information concerning boats and ferries and free camp sites, so that to-day the Bureau can route a tourist to almost any point in the United States or Canada.

Information and literature concerning summer resorts throughout Wisconsin, hotels and points of interest is likewise kept on hand. Literature is also available concerning the great resorts throughout the country, including the national parks.

Last summer Madison placed at the disposal of tourists the first civic camp site east of the Mississippi—Monona Park. This municipal park offers unusual inducements to tourists to camp there because of its location about three miles from the city, its beautiful trees and grassy slopes, and the boating and swimming afforded by Lake Monona, which borders it. A caretaker employed by the city to look after the grounds resides in the park, and tourists may have their mail directed to the park in his care. A quarter of a mile away are stores at which supplies may be obtained. Sign posts are located at each entrance to the city telling the tourist of this civic camp site, where he may enjoy an out-of-doors vacation with ample facilities for comfort.

For the convenience of those who have only a short time to stay in the city, an auto tour through Madison has been laid out. For the traveler who wishes to make Madison his headquarters for a few days or weeks, the Road and Travel Bureau will plan side trips to the lakes and resorts in southern Wisconsin. For those who do not wish to avail themselves of the privileges of the out-of-door camping, the Association of Commerce lists summer cottages on the lakes which may be rented for very reasonable sums.

That the Road and Travel Bureau is a useful department of a commercial organization is shown by the fact that during the tourist season of 1919 the Madison Bureau received from 30 to 50 calls daily for routes and other information. The work is increasing each year because of the personal advertising done by those who have availed themselves of its services in the past.

J. C. BITTERMAN,
Director, Road and Travel Bureau.

Successful County Hospital Campaign

HARTFORD CITY, IND.—A county hospital has long been needed in Blackford County, but no concerted effort was made to secure it until the Chamber of Commerce, organized only last year, got behind the movement. A campaign was launched early in 1920, and at the special election held on March 9 for the purpose of deciding the question, the project was carried by a majority of 790 votes. The amount to be ex-

BEFORE USING TARVIA

Photograph shows wretched condition of Fourth Avenue, Milwaukee, Wis., before it was salvaged with "Tarvia-X."

AFTER USING TARVIA

The same street, showing how the "Tarvia-X" resurfacing has made it smooth, mudless, dustless and traffic-proof.

To Get Good Roads—Cheaply—Quickly —Save the Roads You Have!

MILES and miles of good gravel and macadam roads throughout the country can be restored to meet modern traffic requirements. The way to do this is to utilize the existing road as a foundation for a traffic-proof Tarvia top. And where crushed stone or slag is available, the community so favored not only can save its roads but *save* considerable *money* in the bargain.

Many progressive communities recognize this fact and are carrying out an extended *road salvage program*, rather than build new roads at present exhorbitant prices.

For example, the City of Milwaukee has in this way transformed 1,700,000 square yards of water-bound macadam into splendid modern streets to the complete satisfaction of both the city authorities and the traveling public.

Whether you require a good binder for new construction, a dust-preventive, a patching or maintenance material, Tarvia, in its various grades, provides an economical and satisfactory solution.

Tarvia Roads are durable, dustless and mudless. They are also waterproof and frost-proof and require a minimum of upkeep expense.

Illustrated Booklet, telling about the various Tarvia treatments, free on request.

Tarvia

Preserves Roads–Prevents Dust

Special Service Department

In order to bring the facts before taxpayers as well as road authorities, The Barrett Company has organized a Special Service Department which keeps up to the minute on all road problems. If you will write to the nearest office regarding road conditions or problems in your vicinity, the matter will have the prompt attention of experienced engineers. This service is free for the asking.

If you want *better roads* and *lower taxes*, this Department can greatly assist you. Booklet free on request.

New York, Cincinnati, Minneapolis, Athens, Lebanon — Chicago, Pittsburgh, Dallas, Duluth, Youngstown — Philadelphia, Detroit, Nashville, Salt Lake City, Milwaukee

The Barrett Company

Boston, New Orleans, Syracuse, Bangor, Cleveland — St. Louis, Birmingham, Seattle, Washington, Buffalo — Cleveland, Kansas City, Peoria, Johnstown, Bethlehem, Sydney, N.S.

THE BARRETT COMPANY, Limited: Montreal, Toronto, Toledo, Columbus, Winnipeg, Richmond, Vancouver, Latrobe, Bethlehem, St. John, N.B., Halifax, N.S.

pended is not to exceed $80,000. The victory was not won without a hard struggle. In fact, some of the most prominent citizens said it could not be done. Many difficulties had to be overcome, chief of which was the objection to the additional tax necessary in order to finance the construction and equipment of the hospital.

The Chamber appointed a hospital committee, which drew up a petition, had it signed by the necessary number of freeholders, and presented it to the Board of County Commissioners, who ordered the special election. The services of a publicity man were secured, and he devoted his entire time to the project until the day after the election. An election organization was formed the same as for a regular political election, with precinct chairmen, etc.

Meetings were held each evening in the various precincts, at which four-minute speakers were used to create favorable sentiment, and the Chamber had representatives at the meetings held by other organizations in behalf of the hospital project. In fact, the Chamber of Commerce was everywhere. It obtained the support of the newspapers, which donated advertising space freely. Inspiring editorials were used, and the inhabitants of the county were flooded with circular letters, until everybody was discussing the hospital project. Care was taken to explain how much an individual would be taxed on the value of his holdings, so that he could figure up what the county hospital would cost him personally.

The election cost the county only $99. The Chamber raised a special fund with which to defray the expense of holding it, and the inspectors and clerks served without pay in the majority of the voting places on election day.

When the day finally arrived, the Chamber had fifty automobiles on hand to carry the voters to the polls. Arrangements were made with the manufacturers to permit their employes to be hauled to their voting places at specified times of the day. Nearly every automobile in town had a poster on the wind-shield reading, "Vote YES for the County Hospital," or "We Want a County Hospital," or "The County Hospital is Coming Sure."

P. H. HAWTHORNE,
Secretary, Hartford City Chamber of Commerce.

How the Trenton Chamber of Commerce Builds Retail Trade

TRENTON, N. J.—The Chamber of Commerce of Trenton, through its Retail Merchants' Division, maintains a continuous drive to promote buying in Trenton and to extend its suburban retail trade. Located about midway between New York and Philadelphia, with two steam railroads and an interurban line to each city, also a boat line to Philadelphia, Trenton formerly felt keenly the competition of the big metropolitan stores, but this is being largely overcome by the aggressive work of the Retail Merchants' Division.

Each spring and fall the Division conducts style shows and expositions of all lines of merchandise, marked each time by new and attractive features. Supplementing these, special retail trade events are held on an average of once a month, such as Suburban Day, Dollars Day, Profit-Sharing Day, Free Mileage Day, etc. The last-named is an annual event, when round-trip fare at the rate of three cents a mile is rebated to every suburbanite whose collective purchases amount to $5 or more, these fares being prorated among the participating merchants.

The Chamber of Commerce has built up a mailing list of 4,000 families in the surrounding towns and rural sections, and a handsomely printed notice of each event is mailed to each of them. During the week preceding each event the Chamber has strong advertisements in ten weekly newspapers in suburban towns. These advertisements are usually three columns wide and ten inches deep. Live publicity campaigns are conducted in the Trenton newspapers each time. Splendid coöperation is given by the Trenton merchants in special bargains, window displays and individual advertising. The Chamber of Commerce emblem of a circle enclosing the Trenton pennant, reproduced herewith, and the inscription "Retail Merchants' Division" is made prominent in all the publicity. Also, for each special event a suitable cut is designed and furnished by the Chamber to all merchants who desire to

He little thought that before the night was over, fate would cast dice for this infant's life—would it be three hours or three score years and ten?

Fate — and a Baby's life

"PRETTY fine boy, isn't he, Nurse?" said the proud young father. "Tomorrow you're going to let me hold him for a moment."

It was a load off his mind to know the two for whom he cared for so deeply were in a hospital where they would be well taken care of. No fear that anything would go wrong, doctors within call, a nurse always on duty. Could anything more be asked?

Midnight — an alarm of fire — hours of heart-rending and nerve-racking work by heroic nurses, doctors and firemen.

Another day. The little baby was safe, thanks to the nurse who thought more of its safety than she did of her own. The young mother lay at the point of death, her fight for life doubled by exposure and cold.

Safe? Why had the father and the deluded public thought that hospital safe?

It was the best equipped, best protected in the city. But in spite of fire escapes, fire hose, and every seeming precaution the demon had done his work. Ten persons had been sacrificed.

You — what are you doing to make the lives of the patients in your hospital safe? Have you installed in your building that watchman who never sleeps, the Grinnell Automatic Sprinkler System? No other protection is fool-proof and failure-proof. No bungling nor palsied fingers manipulate it. It is constant—automatic. When the fire starts, the water starts.

The watchword of the new age is Service. What better way can you serve than by seeing that a Grinnell Automatic Sprinkler system is installed in the hospitals, schools and institutions of your community?

Read—*"Fire Tragedies and Their Remedy"*

This instructive booklet will wake you up to the penalty paid by those who have neglected to provide adequate fire protection. A penny for a postal is a small price to pay for human lives. Write for it now. Address the Grinnell Company, Inc., 283 West Exchange Street, Providence, R. I.

GRINNELL COMPANY

Executive Offices — Providence, R. I.

Complete Engineering and Construction Service on Automatic Sprinklers.
Industrial Piping, Heating and Power Equipments. Fittings, Pipe, Valves.

GRINNELL AUTOMATIC SPRINKLER SYSTEM—*When the fire starts, the water starts.*

use it in their advertising.

Each trade event is managed by a special committee appointed for the purpose by the Division chairman. The Committee is discharged when its work is completed. The general Division activities are managed by an Executive Committee selected annually and composed of the chairmen elected by the various retail lines represented in the Division. This Executive Committee selects a new chairman quarterly, and this has established keen rivalry among the respective chairmen, who aim to make each new administration more successful than the last. The Division was created by resolution of the Board of Directors and functions as a large committee rather than as an organization. There are no by-laws, and its informal character obviates the danger of its becoming an independent body. The members of the Division must first become members of the Chamber. The headquarters are in the offices of the Chamber of Commerce, and Managing Secretary Harry D. Conover acts as secretary of the Division.

All the larger stores of the city have plural memberships with the Chamber, the unit being $25 a year. The Division is financed from a budget fixed by the Board of Directors of the Chamber. The general promotion expenses, such as the suburban advertising, printing invitations to suburbanites, window posters, postage, prizes, cuts, etc., are borne by the Chamber of Commerce from the budget of the Division. The Division functions under the Commercial Bureau, of which it is a part, and its bills are audited by the Commercial Bureau Executive Committee before being passed to the Board for payment.

The special trade events being held this year are all emphasizing strongly the Buy in Trenton campaign. This drive was introduced by a Buy in Trenton Day, one of the features of which was an aggressive newspaper guessing contest on the letters "B. I. T.," for which cash prices were offered by the Chamber. Through the energetic efforts of the Division, the retail trade of Trenton has been built up and extended in a marked degree.

HARRY D. CONOVER,
Secretary, Trenton Chamber of Commerce.

BUY IN TRENTON.

Possibly you have Been In The habit of shopping out of town. But I Trust you will Begin In Trenton and Break In Thoroughly and Be Inspired To—"Buy In Trenton," thereby booming Business In Trenton and making prospects Brighter In Town.

You can get the Best In Trenton, and do Better In Trenton, and you can help promote Business Interest Through cooperation with Trenton merchants.

You have all Been Invited To the style show, which has Been Introduced Through the papers. Be It True, let everyone do their B. I. T. toward making Trenton greater for business and prosperity.

HARRY C. SANDHOFF,
118 Harding Street, Trenton, N. J.

THE ARTICLE THAT WON FIRST PRIZE IN THE "B. I. T." CONTEST CONDUCTED IN THE CITY OF TRENTON

BUY IN TRENTON.

"Buy In Trenton" is the meaning of the letters "B. I. T."

This slogan signifies the culmination of the efforts of the enterprising and progressive merchants of Trenton to give to their patrons the most exclusive and yet the most practical and economical merchandise at the most advantageous prices.

BUY IN TRENTON!

MILDRED E. KACHLINE,
Lambertville, N. J.

THE ARTICLE THAT WON FIRST PRIZE IN THE "B. I. T." CONTEST CONDUCTED FOR THE SUBURBS OF TRENTON

$5,000,000 Hotel Financed by Providence Chamber of Commerce

PROVIDENCE, R. I.—A special committee of the Providence Chamber of Commerce has just completed the financing of the Providence Biltmore Hotel, a $5,000,000, 19-story structure to be erected in Providence on the site bounded by Washington, Eddy, Worcester and Dorrance Streets. Building operations will begin July 1.

The Chamber of Commerce made an effort to provide Providence with a large modern hotel before the United States entered the European war. The movement was getting nicely started when the prices of material began to soar, and it was con-

FASHIONS CHANGE

but —

CULVERTS SHOULD BE PERMANENT

FASHIONS and styles have changed many, many times since the first Newport Culvert was laid.

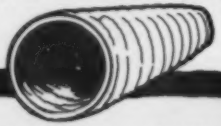
Newport Culverts are good for a long period of years. There is no particular pleasure in ripping up your roads every few years to replace defective culverts. Next time buy Newport Culverts and save all this unnecessary work, annoyance and expense.

Made from genuine open hearth iron. Government tests prove them 99.875% pure iron copper alloy. Absolutely rust-resisting. Their lasting qualities are an assured fact. Serviceable for every service. The half-round culvert is ideal for city service. Used by municipalities all over the country.

Send us your address and we will tell you how better culverts mean better roads.

NEWPORT CULVERT CO.

542 WEST 10th STREET

NEWPORT  KENTUCKY

sidered unwise to make further attempts at that time. A few months after the signing of the armistice, the demand for hotel accommodations became so great that the Chamber made another effort to get the project under way, and appointed a special committee to launch the undertaking. This committee, with Arthur L. Aldred as its chairman, secured an option on the desired site and perfected an agreement with successful hotel operators in New York City to build and operate the hotel. In order to hold the property on which it was desired to erect the hotel, it was necessary to induce ten enterprising citizens to advance $30,000 each to cover the first payment on the purchase price. The committee then negotiated a loan of $1,900,000 with the Metropolitan Life Insurance Company on the land and building of the proposed corporation. The hotel operators will pay the cost of equipping and furnishing the building, nearly $1,000,000, taking second preferred stock in payment therefor.

After the above negotiations had been perfected, the Chamber offered to the people of Providence $2,500,000 worth of first preferred 7 per cent cumulative stock (25,000 shares), knowing that it was a perfectly safe investment, and realizing that it was necessary to take care of the first preferred obligations in order that the operators might even secure the interest on the large sum invested by them.

The campaign to sell the stock was conducted by the Chamber's campaign committee. The majority of it was sold by means of the usual team organization work. Approximately $2,100,000 worth was sold to the members of the Chamber of Commerce and other citizens of Greater Providence. When the sales began to lag, the committee succeeded in inducing the hotel operators to take the stock remaining unsold.

THE NEW HOTEL TO BE ERECTED IN PROVIDENCE, FINANCED THROUGH THE EFFORT OF THE PROVIDENCE CHAMBER OF COMMERCE

Great credit is due to the Town Criers of Rhode Island for the part they played in advertising the campaign. The Chamber had the active coöperation of the Rotary Club and the Kiwanis Club in the sale of the stock. The local press donated a great deal of space to advertising the project, in addition to the space paid for.

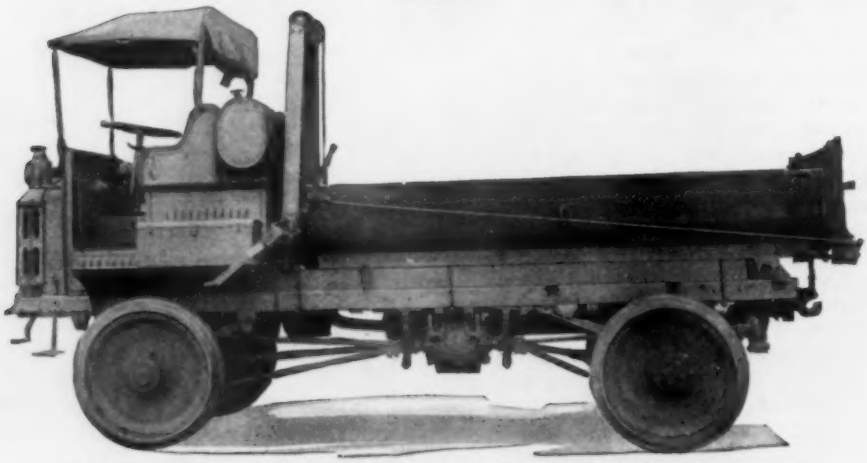
Copies of the printed matter used in this undertaking can be had upon application to the Secretary.

CLARENCE A. COTTON,
General Secretary, Providence Chamber of Commerce.

Stop Burning Up Homes

The housing problem is one of the great issues of the day. All unnecessary construction was forbidden during the war, and now that the restrictions have been withdrawn industrial troubles and the high prices of materials and labor have tended to reduce the amount of building. In many industrial centers newcomers are unable to get houses to live in, rents have gone up, and the situation has become so serious that state and municipal commissions are seeking a solution.

Why not stop burning up the existing buildings, if there are not enough to go around and more cannot be built under existing conditions? Thousands of homes are burned each month, most of them through carelessness. If housing is so important, if homes are so hard to find, why not be careful with those that we have? Apply fire prevention methods. Be careful about matches, smoking, lighting and heating apparatus and gasoline. Clear out the rubbish, inspect the flues, watch the shingle roofs. Conservation is the order of the day, and if the shortage of dwellings will cause householders to be careful about the fire hazards of their homes, one criminal cause of that shortage will be greatly reduced.



A Columbian Lightning Hoist and Dump Body mounted on one of the Government FWD trucks. The Indiana State Highway Commission has 65 trucks with this equipment.

Performance Counts In Road Building!

That is why the

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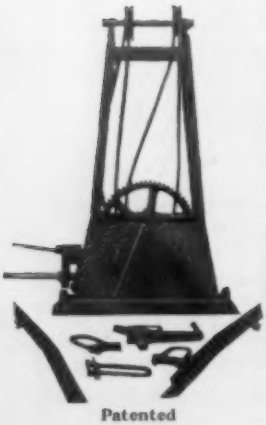
is so often specified when purchasing road equipment. Its record of successful performance in the past assures you of its ability to serve you satisfactorily and economically in the future. No matter what kind of a truck you are using, the COLUMBIAN LIGHTNING HOIST in connection with a Columbian Steel Dump Body will increase the efficiency of your road building equipment by its speed, capacity, and ease of operation.



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The COLUMBIAN LIGHTNING HOIST is based on mechanical principles so simple that there is practically no chance for it to get out of order, yet so sound that one man can easily dump a 5-ton load. While it has been built with the idea of quality rather than price, yet the first cost is so reasonable that this, together with the absence of maintenance costs, makes the Columbian Hoist a most satisfactory purchase from the standpoint of economy.

Write us today for our illustrated circular No. 97 and learn how Columbian Dumping Equipment can serve you.

COLUMBIAN STEEL TANK CO.

"TANKS FOR THE WORLD" — "ESTABLISHED IN 1894"

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The City's Legal Rights and Duties

Information for City Attorneys and Other Municipal Officers, Summarizing Important Court Decisions and Legislation

Conducted by A. L. H. Street, Attorney at Law

Regulating Use of Streets

An ordinance forbidding soliciting of business on a street or public sidewalk must be general in its operation in order to be valid, holds the Missouri Supreme Court in the recent case of Lerner, 218 Southwestern Reporter, 331. The decision annuls an ordinance of the city of St. Louis containing the following quoted provision:

"Any person who shall accost another person on a street or sidewalk in front of any store, house or place of business in the city of St. Louis, and solicit such other person to purchase any goods, wares or merchandise of a like nature as those kept for sale within said store, house or place of business at another store, house, or place of business, or shall solicit such other person to enter such other store, house or place of business, for the purpose of examining or purchasing similar goods, wares, or merchandise, shall be deemed guilty of a misdemeanor, etc."

The Supreme Court concludes that the city possessed ample authority "by legislative enactment not only to establish and improve its streets but to prescribe the terms and conditions upon which they may be used."

The court's ground of objection to the ordinance appears in the following excerpt from the opinion:

"Without reference in detail to the requisites of a valid criminal statute, it will suffice to say that an ordinance, to conform to same, must be general in its terms and uniform in its application to the class of persons or subjects to be affected. If the ordinance, therefore, seeks to regulate citizens in the otherwise lawful use of their property or the conduct of their business, the rules and conditions therein required to be observed must be so specified that all of the citizens may alike be required to comply with same; and no opportunity must be afforded by the terms of the ordinance for the exercise of discrimination between citizens so complying. An analysis of the ordinance will enable it to be determined whether it possesses the infirmity indicated. Instead of prohibiting the general personal solicitation of persons for business purposes upon the streets and sidewalks of the city, its application is limited to the prohibition of such solicitations to persons in like lines of trade in front of the store or place of business of a competitor. Such a classification is neither general in its terms as to the persons to whom it is intended to apply, or to the streets the use of which is attempted to be regulated.

"Certainly, if it be an ill requiring legislative supervision to regulate the solicitation of business upon the streets and highways within the limits prescribed in the ordinance, then it must follow that it is equally an ill to solicit business elsewhere upon any of the thoroughfares of commercial activity in the city. The ordinance therefore cannot be otherwise construed than as special in its terms and local in its application, contravening the constitutional provision that 'where a general law can be made applicable, no local or special law shall be enacted' (section 53, clause 32, art. 4, Const. Mo.), which salutary rule regulating legislation we have shown applies with equal force to an ordinance as well as a state law."

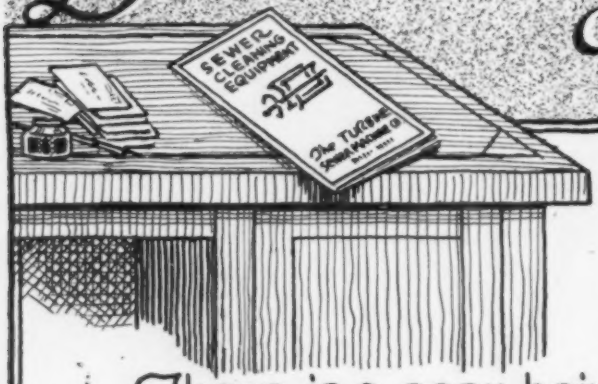
Establishing Alley Grades

Where the authorities of a city have not established the grade of an alley, it will not be inferred, as a matter of law, that the grade is to be on a plane between the established grade of the streets into which the alley enters.

"Equally untenable is the suggestion that the grade of an alley in a city of the first class can be established by custom or dictum or direction of the city engineer or his subordinates. The establishment of such a grade is a legislative act, and can only be done by ordinance. That the assistant city engineer fixed the grade of the alley for the plaintiffs had no more binding effect upon the city than if plaintiffs had appealed to a mere passing pilgrim, and he had fixed the grade."

The defendant city is not liable in damages resulting from injury to plaintiff's property arising from establishment of an

Did you get yours yet? What?



Why, that new Sewer Cleaning booklet of the Turbine Co.

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THIS seventy-two page book including dozens of photographs will be sent free of charge to all those interested in sewer cleaning work. The problem of sewer cleaning is one which confronts the people of every city. The Turbine Sewer Cleaning Machine has effectively solved the problem. It makes little difference how severely clogged a sewer may be——the Turbine will clean and scour it and make it like new. Our work is guaranteed—you take no chances.

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alley grade after plaintiffs graded their property with reference to a grade of the alley unauthorizedly fixed by the city engineer. (Missouri Supreme Court, Castle vs. City of St. Joseph, 219 Southwestern Reporter, 611.)

Supply of Impure Water to Consumers

One who has contracted typhoid fever from water furnished by a city in the operation of a municipal water plant is not entitled to recover damages from the city on a theory of breach of an implied warranty on the part of the city that the water was wholesome. So held the Appellate Division of the New York Supreme Court in the recent case of Canavan vs. City of Mechanicville, 180 New York Supplement, 62. In the course of its opinion the court says:

"It is the common-law rule that accompanying all sales by a retail dealer of articles of food for immediate use there is an implied warranty that the same is fit for human consumption. * * * An implied warranty of personal property is a collateral contract attending a sale thereof, so that, unless there be a sale with the ordinary circumstances of transfer of title and possession of the thing sold, for a price given for that particular thing, the peculiar facts out of which a warranty is implied do not exist, and there is no warranty. It is therefore necessary, first, to inquire whether there was between these parties, in reference to the water furnished, a transaction of bargain and sale accompanied by the incidents ordinarily attending such a sale as between a tradesman and a customer.

"When water is diverted by a city from rivers, streams, and springs, and is allowed or compelled to flow into storage reservoirs, from which it is again allowed to flow through a network of mains and pipes into the homes, the streets, and buildings of a city, so that the occupants of dwellings are, for a compensation, furnished with a supply of water, it may well be doubted whether the water so furnished is a commodity which is bought and sold. * * * Rather it would seem that this plaintiff, for a compensation paid, enjoyed a right or privilege to make use of water as it passed through his dwelling, conducted in pipes installed by the defendant, precisely as a riparian owner might enjoy the right to take water from an open stream. * * * In the instance of articles of food ordinarily sold, the seller has the physical custody thereof, so that inspection and examination may be had, and the buyer may assume that they are made. Water supplied from a reservoir is never in the actual physical custody of the seller. Every one knows that almost universally all such water is collected from running streams, rivers or lakes, which are themselves supplied by the drainage of wide areas of land; that such water runs over the earth uncovered to the air, or percolates through soil; that it is collected for distribution in large ponds; that the soil through which or over which it passes cannot minutely be examined; that contamination of the water can be restricted, but not prevented; that inspection alone will not reveal the presence of bacteria; that analyses of the great volume of moving water collected in the ponds cannot be made; that an inspection, an examination, or an analysis of every drop of water furnished is beyond the power of the seller."

Powers of Pennsylvania Cities

A municipality is merely an agency instituted by the state for the purpose of carrying out in detail the objects of government. The Legislature may enlarge or diminish its territorial extent or its functions, or modify its internal arrangement, or destroy its very existence.

Under a law enacted by the Pennsylvania Legislature in 1919, cities of the first class are without power to borrow money for purposes other than capital outlay. The act provides:

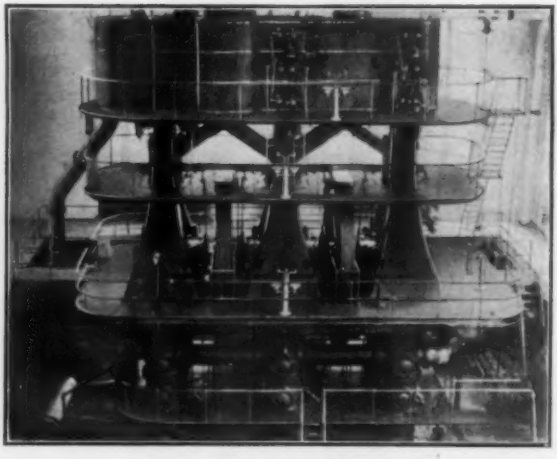
"It shall be lawful for such city to borrow money or incur debt, in accordance with the terms of existing law, for the purpose of acquiring property, erecting buildings, bridges or other structures (but not for the repair of the same), paving streets (but not repaving or repairing the same), or for any other permanent improvements or capital outlay of any kind, provided that all of such proposed expenditures are certified to the city council by the city controller to be capital expenditures as distinguished from current expenses, prior to the authorization of such debt. The certificate of the city controller shall be final and conclusive as to the character of the proposed expenditures. It shall be unlawful for the city to borrow money or incur debt for any purposes other than above specified, except in the case of loans for periods not to exceed one year as provided in this act; provided, however, that if during the preceding year current funds have been used for which it would have been lawful to borrow money as herein provided, and the city controller shall so certify, the current funds may be reimbursed out of the loan funds borrowed for that purpose."

The act is constitutional. (Pennsylvania Supreme Court, Kraus vs. Philadelphia, 109 Atlantic Reporter, 226.)

Pennsylvania Vehicle Licenses

The provision of the Pennsylvania Borough Code, empowering boroughs to "enact

Attention Water Works Men!



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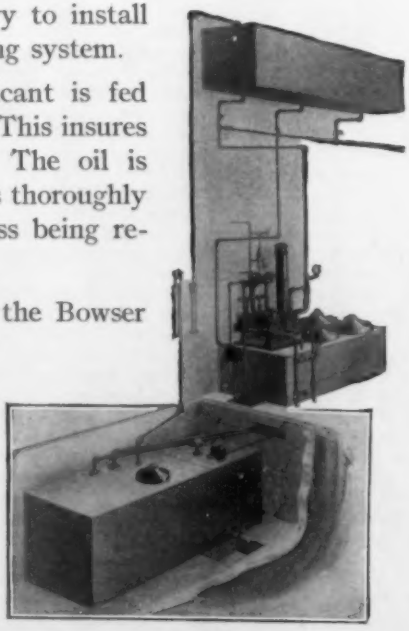

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ordinances establishing reasonable rates of license fees on all vehicles used in carrying persons or property for pay," etc., and an ordinance enacted thereunder, do not apply to use by merchants of vehicles in delivering goods sold to customers. (Washington County, Pa., Court of Common Pleas; Borough of New Eagle vs. Frey; 2 Pennsylvania Municipal Law Reporter, 231.)

Alternative Specifications for Street Work

Specifications for a street improvement in a resolution of intention are not invalid because calling for culverts of iron "or" steel, it not being shown what, if any, difference there will be in cost, or that it will injuriously affect the property owner, or that conditions of the industries producing culverts may not make the alternative necessary in order to prevent unreasonable delay in completing the improvement.

Reaching this conclusion in the case of Shepherd vs. Chapin, 188 Pacific Reporter, 571, the California District Court of Appeal said:

"In Thoits v. Byxbee, 34 Cal. App. 226, 167, Pac. 166, it was held by this court that the specifications there considered were not invalidated by a provision authorizing the street superintendent to change the proportions of sand and rock in the concrete, for the reason that it appeared that it would not affect the cost of the work so far as these ingredients were concerned.

"In Burnham v. Abrahamson, 21 Cal. App. 248, 131 Pac. 338, where the specifications provided that the cement should be composed in part of hard sandstone, granite, basalt, or other close-grained rock, it was said:

"'One or the other kinds of material may be found when the work is commenced not to be as available as the other. Indeed, many contingencies may arise in work of this character which cannot be foreseen, and which could not be met or overcome in the absence of some discretion committed to the superintendent of streets.'"

Municipal Taxation of Corporations

Although a city may not tax a corporation's right to do business in the city after collecting from it a franchise tax, it may impose a license fee upon such agencies as are not essential in the conduct of its business. An ordinance of a Kentucky city of the fourth class, imposing a license tax on an express company for maintaining an office or agent in the city, is invalid as involving double taxation, where the company has paid a franchise tax. (Kentucky Court of Appeals, Commonwealth vs. American Railway Express Co., 218 Southwestern Reporter, 453.)

On the Calendar of Conventions

JUNE 16-17.—BEMIDJI, MINN.
League of Minnesota Municipalities. Annual convention. Executive Secretary, E. L. Bennett, University of Minnesota, Minneapolis, Minn.

JUNE 16-23.—DES MOINES, IA.
General Federation of Women's Clubs. Biennial convention. Corresponding Secretary, Mrs. Mary I. Wood, Portsmouth, N. H.

JUNE 17-19.—ST. LOUIS, MO.
United States Junior Chamber of Commerce. First annual convention. Secretary, William R. Simmons, Terre Haute, Ind.

JUNE 20-26.—MICHIGAN CITY, IND.
Indiana Commercial Secretaries' Association. Annual convention. Secretary, S. H. McClary, Chamber of Commerce, Terre Haute, Ind.

JUNE 21-23.—VANCOUVER, B. C.
Canadian Public Health Association. Annual meeting. General Secretary, R. D. Defries, M. D., Toronto, Ont.

JUNE 21-25.—ATLANTIC CITY, N. J.
International Association of Rotary Clubs. Annual convention. Secretary, Chesley R. Perry, 910 South Michigan Avenue, Chicago, Ill.

JUNE 21-25.—MONTREAL, QUE.
American Water Works Association. Annual convention. Secretary, J. M. Diven, 153 West Seventy-first Street, New York City.

JUNE 22-24.—STROUDSBURG, PA.
Association of Pennsylvania Boroughs. Annual convention. Secretary, J. Herman Knisely, Capitol Building, Harrisburg, Pa.

JUNE 22-25.—PHILADELPHIA, PA.
American Society for Testing Materials. Annual meeting. Assistant Secretary, C. L. Warwick, University of Pennsylvania, Philadelphia, Pa.

JUNE 23.—NEW LONDON, CONN.
Mayors' Association of Connecticut. Mid-summer meeting. Secretary, Dr. J. M. Coburn, Norwalk, Conn.

JUNE 29-JULY 2.—WHITE SULPHUR SPRINGS, W. VA.
American Institute of Electrical Engineers. Annual convention. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

JULY 4-10.—SALT LAKE CITY, UTAH.
National Education Association of the United States. Annual meeting. Secretary, J. W. Crabtree, 1400 Massachusetts Avenue, N. W., Washington, D. C.

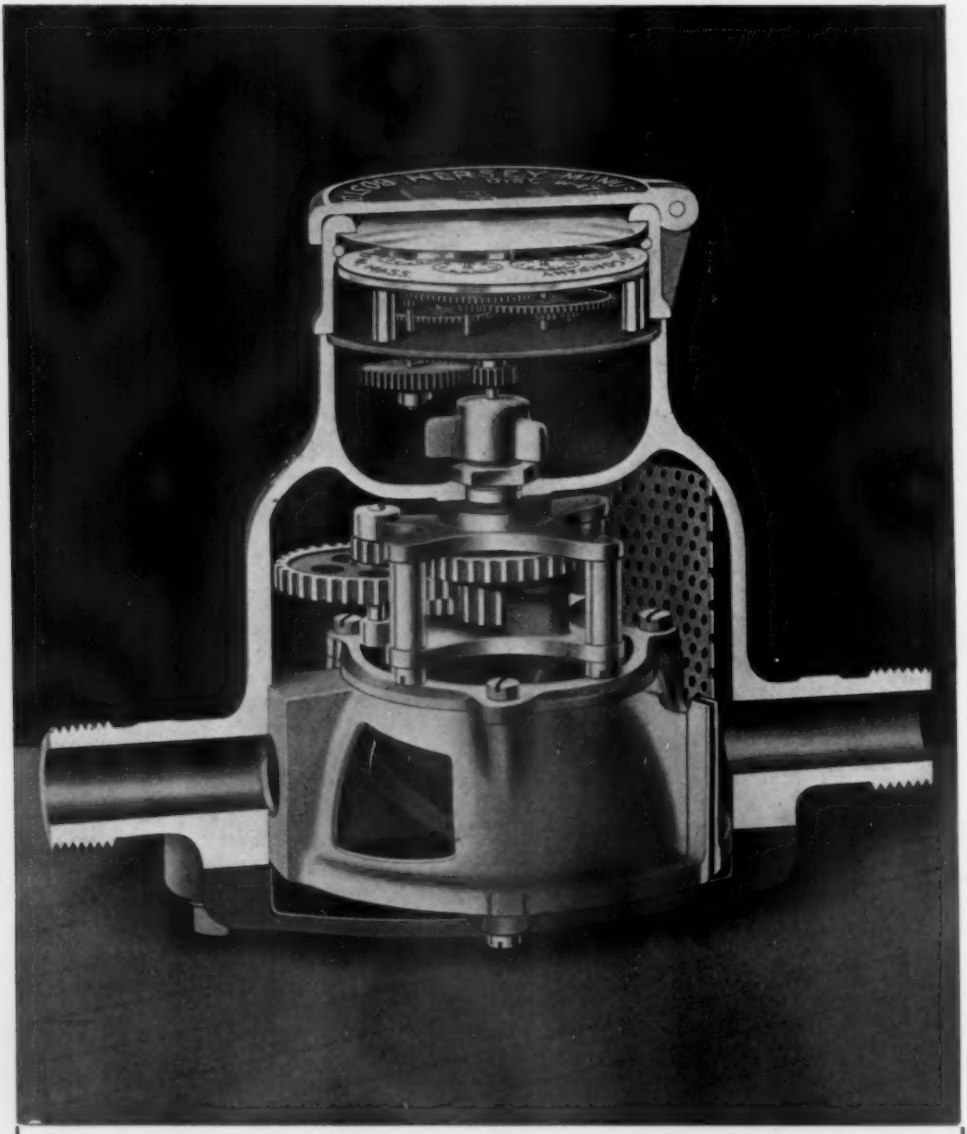
JULY 6-8.—JAMESTOWN, N. Y.
Conference of Mayors and Other City Officials of the State of New York. Annual conference. Secretary, William P. Capes, 25 Washington Avenue, Albany, N. Y.

JULY 26-30.—TORONTO, ONT.
International Association of Fire Engineers. Annual convention. Acting Secretary, Stephen E. Hoey, Room 1130, Municipal Building, New York City.

AUGUST 3-7.—ST. THOMAS, ONT.
Dominion Association of Fire Chiefs. Annual convention. Secretary, Chief James Armstrong, Kingston, Ont.

AUGUST 10.—PORTLAND, ORE.
American Society of Civil Engineers. Annual convention. Acting Secretary, H. S. Crocker, 33 West 39th Street, New York City.

OCTOBER 12-15.—ST. LOUIS, MO.
American Society of Municipal Improvements. Annual convention. Secretary, Charles Carroll Brown, 404 Lincoln Avenue, Valparaiso, Ind.



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Municipal and Civic Publications

Landscape Architecture.

HENRY VINCENT HUBBARD, Assistant Professor of Landscape Architecture at Harvard University, and THEODORA KIMBALL, Librarian of the School of Landscape Architecture at Harvard University. Harvard University Press, Cambridge, Mass. 1920. 132 pp.

A comprehensive classification scheme for books, plans, photographs, notes and other collected material, with combined alphabetical topic index and list of subject headings. Defining landscape architecture as "the art of fitting land for human use and enjoyment," this classification, which has been in the course of preparation for a number of years, gives a comprehensive system of headings which will prove of value to all who have to file material relating to this subject. The basis is a numerical one, paralleling the Library of Congress classification in such a way that those having access to the material contained in the Library of Congress will feel at home. The general method is that provided in a similar classification published in 1913 on City Planning by the Harvard University Press. The classification is applicable to large or small collections of material and provides for the arrangement of all sorts of published literature. The index to the Landscape Architecture Classification serves also as a selected list of subject headings with cross-references under which catalog cards or index references to notes may be conveniently arranged.

Sanitation for Public Health Nurses.

HIBBERT W. HILL, M. D., Executive Secretary, Minnesota Public Health Association. 1919. viii + 211 pages.

A very interesting and instructive volume for that rapidly increasing class of much-needed public officials, the public health nurses. It contains a concise statement of the general principles of public health and methods of combating various infectious diseases and insuring the cleanliness of food, water and milk, and the prevention of too rapid growth of insect life, with a closing chapter on vital statistics.

Food Inspection and Analysis.

ALBERT E. LEACH, S. B., revised by Andrew L. Winton, Ph. D., formerly Chief of the Chicago Food and Drug Laboratory, Bureau of Chemistry, U. S. Department of Agriculture. Fourth Edition. John Wiley & Sons, Inc., New York. 1920. xix + 1,090. Illustrated.

A book prepared with the requirements of the public analyst connected with the health laboratory kept mainly in view, and containing sufficient of a general nature to well acquaint coöperating officials with the provisions of laws dealing with the suppression of food adulteration in states and municipalities. Close attention is paid to the use of the microscope in food analysis, and a very valuable set of illustrations is given at the end of the book, showing photomicrographs of cereals, legumes, starches, coffee, chicory, cocoa, tea, spices, and other materials.

A National System of Education.

WALTER SCOTT ATHEARN, Director Department of Religious Education and Social Service in Boston University. Given as the Merrick Lectures for 1919. George H. Doran Company, New York. 1920. xi + 132 pp. Diagrams and index.

Starting with the premises that universal education is the only guarantee of democratic government and that the present tendency in American education constitutes a national crisis, this book presents a program which it is thought will overcome many of the weaknesses and dangers in the present situation and offer educational privileges to everybody. Mr. Athearn feels that a national system is necessary, including the use of Federal funds and the creation of a Secretary of Education in the cabinet. He points out that the benefits of centralized authority must be preserved without destroying local initiative and moral freedom and initiative on the part of the teaching profession. The dangers lying in a system of vocational education which trains one group for industry and another for professional activities are stressed. The idea is further developed that the national public school system must be supplemented by a system of religious schools (Catholic, Protestant and Jewish) paralleling the public schools.

What Is the Eventual Street Cleaning Method?

GEORGE C. DODGE, 501 Fifth Avenue, New York. 1920. Illustrated.

This is a compact and thorough discussion of present and past methods of street cleaning, including the hand patrol, the horse-drawn sweeper, the squeegee, flushing, motor-driven combination machines, vacuum cleaning, and a very general outline of possible effective future methods. The illustrations are to the point and show many types of street-cleaning machines in action.

Tuberculosis and Public Health.

H. HYSLOP THOMSON, M.D., D.P.H., County Medical Officer of Health, County Tuberculosis Officer and School Medical Officer for Hertfordshire, England. Longmans, Green & Co., New York. 1920. xi + 104.

A comprehensive discussion of tuberculosis, including causes, prevention, contra-infection and schemes of treatment. It is written from the point of view of the public health officer rather than from that of the medical practitioner.

Homes for Workmen.

Southern Pine Association, New Orleans, La. 1919. 250 pp. Illustrated.

This book is a presentation of leading examples of industrial community development, with articles by a number of architects and town planners. The illustrations include numerous detailed plans of inexpensive wooden houses, designed to be built and rented at low prices. The book especially treats of industrial community housing, but the articles and illustrations will be of equal utility to other agencies interested in housing problems.

The Science of Highway Traffic Regulation (1899-1920).

WILLIAM PHELPS ENO, formerly Chairman of the Citizens' Street Traffic Committee, New York City. Brentano's, New York. 1920. 100 pp. Illustrated.

"It can be set down as a traffic axiom that familiarity by the public with the general highway traffic regulations is the key to effective and economical traffic management." With this sentence as its text, the manual covers the entire field of street traffic management, discussing street traffic legislation, mechanical signs and guides, the role of the police, special highway traffic regulation, and suggested changes to assist the movement of traffic in particular districts. It includes a bibliography of books, pamphlets, articles and addresses on traffic regulation by the author and by others.

Patrons of Democracy.

DALLAS LORE SHARP, Professor of English, Boston University. The Atlantic Monthly Press, Boston. 1920. ix + 57.

An argument to persuade parents that they should send their children to public rather than private schools, for the sake of the democratic influences and training. It is an expansion of an article which appeared in the *Atlantic Monthly* for November, 1919.

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The Monroe is error-proof. Its operation is purely mechanical. You can even do Long Division without looking at the machine.

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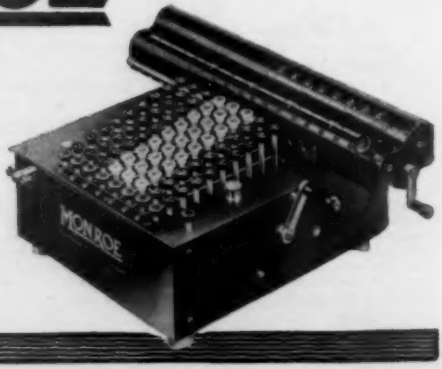

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Trade Associations in New York City.

A classified list of trade and allied associations and publications issued April 1, 1920, by the Chamber of Commerce of the State of New York. 24 pp. The list does not aim to be complete, but to cover the trades upon which the New York Chamber of Commerce has received numerous inquiries, and the trade papers which have been especially brought to the attention of the Chamber's office. (Apply to the Chamber, 65 Liberty Street, New York, N. Y.)

Checking Schedule for Projected School Buildings.

By James O. Betelle, A. I. A., member of the firm of Guilbert & Betelle, Architects, Newark; Lecturer on School Architecture at Teachers College, Columbia University. In his relations with school board members and building committees the author has found that the greatest single difficulty which school boards encounter is due to the fact that they do not know how to start and just what line of procedure to follow. The original copy of the pamphlet was made up of notes based on correct procedure as suggested by him to numbers of school boards. These notes were gradually developed from observation and from actual practice, and were later used in lectures to superintendents of schools and graduate students in school administration. (Published by The Bruce Publishing Company, 354 Milwaukee Street, Milwaukee, Wis.)

The New York Association for Improving the Condition of the Poor.

76th Annual Report of the N. Y. A. I. C. P. for the year ended September 30, 1919. Entitled "Last Year's Work and This Year's Challenge." 133 pp. Illustrated. (Apply to the Association, at 105 East 22d Street, New York City.)

Every Child in School.

A 15-page pamphlet issued by the Children's Bureau of the U. S. Department of Labor. (Children's Year Follow-up Series No. 3; Bureau Publication No. 64), presenting a report on the Back-to-School drive, which was started during Children's Year. It shows the methods and the results of the drive and the work still to be done. The proposed minimum standards for children entering employment are given. (Write to the Children's Bureau, Washington, D. C.)

Concrete Sewers.

Report of the Committee on Concrete Sewers of the American Concrete Institute prepared for the convention of February 16-18, 1920, in Chicago. 18 pp. Submitting "Proposed Standard Specifications for Neolithic Concrete Sewers and Reinforced Concrete Pipe Sewers, and Recommended Rules for Concrete Sewer Designs." Apply to Henry B. Alvord, Secretary, American Concrete Institute, 6 Beacon Street, Boston, Mass.)

The Roads of Baltimore County, Md.

Annual Report of the Baltimore County Roads Engineer for the year ending December 31, 1919. (Address William G. Sucro, Roads Engineer, Towson, Md.)

"Why and How is the Playground and Recreation Association of America."

In this 16-page pamphlet Charles Frederick Weller answers the question expressed in the title. The work of the National Physical Education Service, maintained by the Playground and Recreation Association of America, with headquarters at 309 Homer Building, Washington, D. C., is described. It is illustrated with particular effectiveness in the story of the recreation plan developed for one locality in a rural and small-town county. What the Association has done to secure state laws enabling counties, towns and cities to manage locally their recreation agencies is stated, and its work in standardizing boys and girls in physical efficiency, in prescribing and executing courses of action, and in furnishing printed material on the organization and management of community recreation, is explained. (Apply to the Association, at 1 Madison Avenue, New York City.)

Commercial and Industrial Organizations of the United States.

A revision, to November 1, 1919, of the list of interstate, national, international, state, territorial, and local commercial and industrial organizations in the United States, issued by the U. S. Bureau of Foreign and Domestic Commerce. Only those organizations which made reply to the Bureau's request for information have been included. The list is believed to be fairly complete with regard to the active state and national associations. The information includes the classification of the organization and the name of the secretary, and in the case of local bodies, the number of members, the primary purpose of the organization, its income and the month of the annual meeting. All the data given are for 1919, and the population figures are from the latest Census Bureau reports. (Apply to the Superintendent of Documents, Government Printing Office, Washington, D. C.)

How Public Health Is Protected in Toledo.

An elementary study prepared for use in the Toledo public schools and published by the Commission of Publicity and Efficiency April 17, 1920, as a supplement to *The Toledo City Journal*. Quarto. 8 pp. Illustrated. The protection which the city gives to the water-supply and the food supply, what it does to prevent the spread of disease and to eliminate unsanitary conditions, its method of keeping records and statistics, the health work in the schools and in county institutions, and the recreational facilities, are all explained. Space is also given to the work of private health agencies, and the city laws on food, housing, sanitation, keeping of animals, and spitting are summarized. (Apply to the Commission of Publicity and Efficiency.)

The Public School System of Memphis, Tenn.

A report, in seven parts, of a survey made under the direction of the U. S. Commissioner of Education, including the following: Part 1—I. An Industrial and Social Study of Memphis, II, School Organization, Supervision, and Finance, III, The Building Problem; Part 2—I, The Elementary Schools, II, The High Schools; Part 3—Civic Education; Part 4—Science; Part 5—Music; Part 6—Industrial Arts, Home Economics and Gardening; Part 7—Health Work. 1920. (Apply to the Government Printing Office, Washington, D. C.)

Municipal Reports

Cincinnati, Ohio.—Annual Report of the Department of Street, Sewer and Catch-Basin Cleaning for the Year 1919. (Apply to Fred Maag, Superintendent of Street Cleaning Department.)

Greenwood, S. C.—Annual Reports of Town Council and Water and Electric Light Plant. Receipts and Disbursements for the Year 1919. (Apply to J. R. Devlin, City Clerk.)

McPherson, Kans.—Sixth Annual Report (Year of 1919) under Commission Form of Government. Photographs and graphic charts. (Apply to Miss Ellen Lundstrom, City Clerk.)

Milwaukee, Wis.—Annual Report of the Water Works for the Year Ended December 31, 1919. (Apply to H. P. Bohmann, Superintendent of Water Works and Water Purification.)

Pasadena, Calif.—History of Pasadena's Municipal Light and Power Plant. By C. Wellington Koiner, General Manager and Mechanical-Electrical Engineer. Photographs and graphic charts. (Apply to Mr. Koiner.)

Pasadena, Calif.—Fifth Annual Report, Municipal Printing Department, Year Ending June 30, 1919. (Apply to J. P. Randolph, Manager, Municipal Printing Department.)

Toledo, Ohio.—Annual Report, Division of Health, 1919. Published by the Commission of Publicity and Efficiency as a supplement to "The Toledo City Journal." (Apply to the Commission.)

Winston-Salem, N. C.—Third Annual Report of the Department of Health for the Year Ending December 31, 1919. Graphic charts and photographs. (Apply to Miss Annie H. Snyder, Secretary of the Department.)

Newton, Mass.—Annual Report of the Street Commissioner for the year ending December 31, 1919. (Apply to Ella F. Olmstead, Chief Clerk.)

San Diego, Calif.—Annual Report of the Financial Affairs of the City for the year ending December 31, 1919. (Apply to H. L. Moody, City Auditor.)

Estimates of Cost of Proposed Work
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Methods, Materials and Appliances

News for Boards of Public Works, Engineers, Contractors, Purchasing Agents, and Others Interested in the Economical Construction and Efficient Operation of Public Improvement Undertakings

Omaha to Have Clean Water-Mains

The city of Omaha, Nebr., has entered into a contract with the National Water Main Cleaning Company to have all the city's large feeder mains cleaned, from the Minnelusa pumping station in Florence to the stock yards in South Omaha.

The main supply of water for Omaha reaches the city from the pumping station through two mains, one 48 inches and the other 36 inches in diameter, the 48-inch main extending into 24th and Lake Streets. From Lake Street south to the stock yards the main lines are composed of 36-inch, 30-inch and 24-inch, all cast iron pipe.

Upon examining the supply, it was found that should a shut-down of the 48-inch pipe be necessitated from any cause, there would be a likelihood of great shortage of water. The carrying capacity of the 36-inch main was greatly reduced, owing to the growth of scale, which the contractor agreed to remove in such manner that the carrying capacity would be restored to within 5 per cent of that of new pipe as given in Hazen and Williams tables, coefficient 120.

The work of cleaning was started in October, 1919, and before work closed down for the winter the cleaning was completed from the pumping station to 24th and Lake Streets, a distance of approximately four miles.

The method employed in this cleaning was to dig down and uncover the pipe in two places. At the upper end of the line the pipe was opened by cutting out a section about 8 feet in length. The cleaning machine was inserted into a new section of pipe, and this new section was placed in the cut, sleeved and leaded in permanently. At the lower end of the section to be cleaned, which in the above case, was about a mile from the point where the machine was entered, a similar cut was made in the pipe. A 45-degree curve was installed temporarily, and a riser pipe was connected to the curve to carry the wash water, cleanings and cleaning machine out into the street, as shown in the accompanying illustration. After the riser pipe was placed, the pressure from the pumps was turned on back of the machine by opening a valve, and the machine was forced through by water pressure. The cleanings are always kept ahead of the machine by the wash water, which passes the pistons through port holes, opened by the operator to allow a suit-

A WATER-MAIN CLEANING MACHINE JUST AFTER EMERGING FROM A 36-INCH MAIN WHEN OMAHA HAD ITS PIPES CLEANED OUT

A Modern Lighting System

does *not* require separate Lamp Standards as this street scene clearly shows.

Missoula, Montana, is one progressive western city utilizing "ELRECO" Combination Railway and Lighting Poles, which makes separate Lamp Standards unnecessary.

The "ELRECO" Steel Poles support ornamental lighting brackets with modern General Electric Lighting units; also, the span and service wires of the Railway and Lighting Company; keep the streets free and unobstructed from extra Lamp Standards, wooden poles, and a multiplicity of wires, etc.

The usual practice of financing such an installation is to divide the cost between the local Street Railway and Lighting Company, Merchants and the City, making the cost of "WHITE WAY" very reasonable.

What other progressive cities have accomplished is well illustrated in our handsome Catalog "F", sent on request to those interested.

Electric Railway Equipment Company

CINCINNATI, OHIO.

New York Office — 30 Church Street

able amount of such wash water.

The cleaning machine used for this work consists of three sections: the first carries three rings or bands with spring steel cutting blades; the second section consists of three bands carrying spring steel cutting blades and one piston; the third section consists of one piston. The sections are flexibly connected. The two pistons are constructed so that when under water pressure they expand to the full diameter of the pipe. The cutting and scraping blades mounted on the carrying rings would actually fill a pipe 1½ inches larger in diameter. Therefore, when compressed to the diameter of the pipe being cleaned, they exert outward pressure, which is necessary to remove the more tenacious scales. The machine is constructed to revolve slowly, equalizing the wear on the scrapers, which perform their work by moving straight in the direction of the line of the pipe.

The operator also follows the machine as it passes through the line, for he can hear it from the top of the ground.

In the case of the Omaha cleaning there were certain obstacles to be overcome; as, for instance, when the company which built the Omaha plant before the Omaha district bought it, decided to place a 30-inch gate valve in the 36-inch line with reducer and increaser, because it was cheaper than a 36-inch valve. This valve was removed, and a full-size 36-inch valve was placed in the line.

The cleaning of water-mains by the "National Method" is done for two distinct reasons.

1. To restore carrying capacity to that of new pipe and thereby increase fire protection, and also to save coal by reducing friction head in pumping lines.

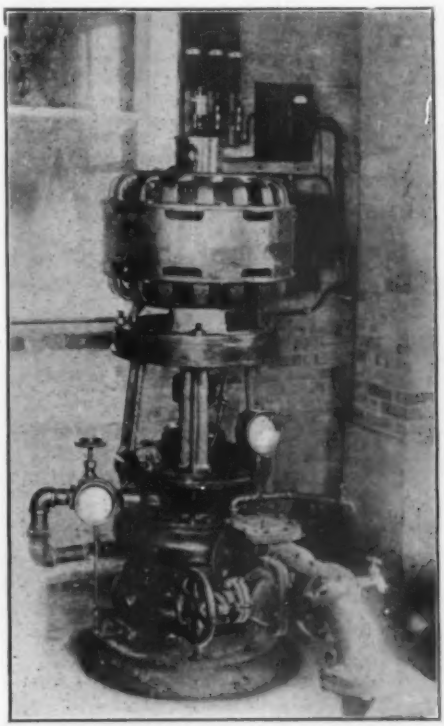
2. To remove mud and scale from water-mains and thereby remove germs and objectionable foreign matter which may help to make water unfit for domestic use.

Changes in Kennedy Valve Personnel

The Kennedy Valve Manufacturing Company, Elmira, N. Y., has recently announced the appointment of C. H. Kennedy, formerly New York District Manager, as General Sales Manager, with headquarters at the plant in Elmira, N. Y. Mr. Kennedy's place in the New York office has been taken by J. S. Hanlon, formerly Boston representative, and George W. Waters, formerly in the Sales Department of the New York office, has been made Boston representative. In addition, sales offices have been opened at 208 Mutual Building, Kansas City, Mo., with F. N. Decker in charge. Mr. Decker has for many years been connected with the company at the plant in Elmira.

Economical Pumping Units in Maryville, Tenn.

The city of Maryville, Tenn., is situated about fifty miles south of Knoxville, and has a population of about 10,000. The water department is the pride of the town, there being 700 services, all metered, and 14 miles of water-main. There are two 12-inch wells 200 feet deep, one of which is pumped by air lift having a capacity of 300 gallons per minute, delivering water into a 100,000-gallon collecting basin. From this basin a 600-gallon-per-minute centrifugal pump forces the water into the main and into a 125,000-gallon tank, located 120 feet above the pump. Added to this equipment is a centrifugal power pump of 1,000-gallons-per-minute capacity against a 125-pound head. About two years ago there was added one No. 8 unit of the Wills pumping system, of which Wirt J. Wills of Memphis, Tenn,, is manufacturer and patentee. This pump has a capacity of 430 gallons per minute, pumping direct from the 12-inch well into the main against a 120-foot head. This pump is operating at 50 per cent less cost than the air lift and centrifugal pump because it is more efficient and the water is handled but once. The pump has proved very dependable, according to F. D. Liscomb, Superintendent of Water-Works, as it has never been given any more attention than to fill the oil cups, and start and stop the pumps. Not five cents has been spent on repairs.



THE DEEP-WELL UNIT THAT SUPPLANTED TWO OTHER PUMPS IN MARYVILLE, TENN.

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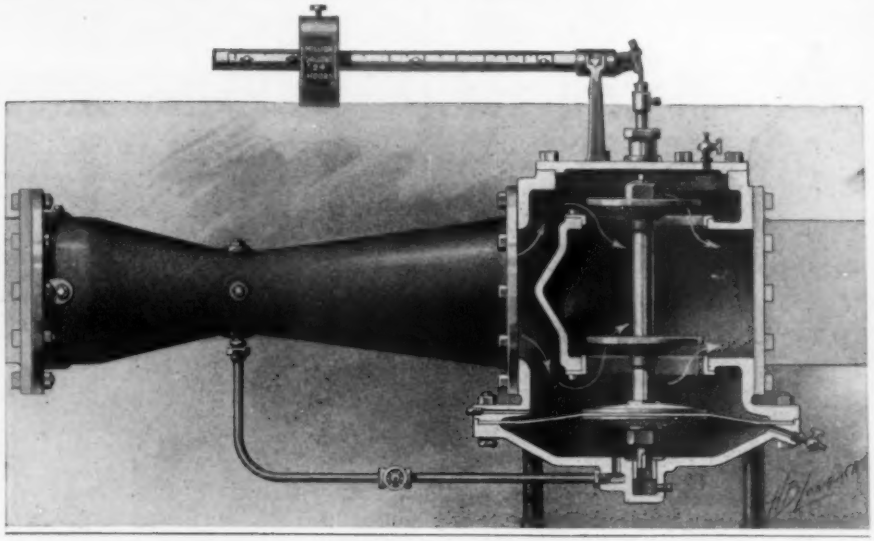

REGULATING DEVICE FOR CONTROLLING THE RATE OF FLOW FROM MECHANICAL FILTERS

Controlling the Rate of Flow from Filters

In order to secure best operation from mechanical or slow sand filters, the rate of flow must be absolutely controlled at all times and not permitted to fluctuate rapidly, as this is liable to cause breaks in the filtering medium on the surface of the bed. Simplex rate controllers, manufactured by the Simplex Valve and Meter Company, 5722 Race Street, Philadelphia, Pa., have been found very dependable in the 200-odd water filtration plants using them. The controllers range from 3-inch effluent controllers in small units to 20-inch and over on large units in city plants.

The principle of operation, which may be readily followed from the accompanying illustration, is that water first enters the venturi tube and discharges through the balanced valve to the outlet. The controller consists of two members: first, the venturi tube with a discharge flange connected to a valve body; second, the valve body with a double disc type balanced valve. The valve stem is guided in the upper and lower covers, engages a diaphragm near the bottom and has a flexible connection at the top. For any given rate of flow, there is a certain difference in pressure between the body and in the throat of the tube. This is due to the different velocities in these areas. The pressure on top of the diaphragm, being greater than that beneath it, creates a pull that must be balanced by the counterweight on the longer end of the scale beam. It is only a constant rate of flow that will balance the counterweight pull and the diaphragm load.

New Models of Hersey Disc Meters

The Hersey Manufacturing Company, South Boston, Mass., is celebrating the 35th anniversary of its entrance into the field of the manufacture of water meters by placing on the market two new models of disc meters, namely model HF (frost-protected type) in the smaller sizes and model HD (divided-case type) in the larger sizes. These meters are claimed to possess all the desirable features of this company's models F and D which have contributed to the success and standing of these models among water meters. In addition there have been incorporated certain valuable improvements which are the result of experience. These meters are essentially of the direct-flow type. The water makes the least possible number of turns or changes of direction in passing through the meter, and consequently there is the greatest possible elimination of loss of pressure due to hydraulic friction.

Because of the direction of the flow, the size and shape of the inlet and outlet ports and their relation to each other, there has been produced an almost perfectly self-controlled disc meter, i. e., a meter in which the path of the disc piston does not have to be determined by a mechanical control. This means the elimination of mechanical friction and consequently an increase in accuracy, sensitiveness and durability. These meters are balanced to water pressure so that there are no false strains set up under either static or dynamic conditions. This fact contributes towards the ease of operation.

The interior or working parts "assembly" is cylindrical—it is turned straight on the outside; likewise the cases are bored without taper. The disc chamber has three bearing points, one of which, opposite the outlet port, is faced off under-size, and in this face and in the bearing in the case with which it coincides a key-way is cut. In this key-way is

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fitted a curved spring key, the function of which is to keep the interior parts in contact with the case where the outlet ports of the chamber and the case join and to permit the easy removal of the disc chamber by the simple withdrawal of the key. It is not necessary to strike, jar or otherwise abuse these meters in order to remove the working parts. When the key is withdrawn, the working parts are perfectly free. A further advantage of the spring key is that the inside or working parts are free from liability to distortion or other derangement due to any unusual strains which might be set up against the outside case in the process of testing or connecting into a pipe line. The manufacturers claim that these two models form a series which excels meters of all other makes in those essentials which make up an exceptionally desirable meter.

"Movies" to Show Impact of Motor Trucks

"Slow" moving pictures, recently used as unique features of pictorial news weeklies to show every motion of a person in varied sports, have found a field in many lines of industrial experiments that will prove invaluable to future development.

By the use of a new type of camera, whereby exposures are made at the rate of 160 instead of 16 a second, and then projected at one-tenth normal speed, Chief Engineer A. F. Masury of the International Motor Company, has been able to record photographically the comparative road impact and chassis shock of motor trucks shod with pneumatic or solid tires.

Two trucks of similar design were used, one shod with the pneumatics on front and solids on the rear, the other equipped with pneumatics all around. Both were run at a speed of from 15 to 18 miles an hour along a straight stretch and over a sharp incline that caused them to spring into the air and strike ground as from a vertical drop of from 2 to 3 feet.

Newly-invented timing and impact registering devices attached to the camera lens and operated simultaneously, substantiated the results of similar tests recently conducted by experts of The Goodyear Tire & Rubber Company. The solid-tired truck, although 620 pounds lighter, struck ground with a force of 14,336 pounds as compared to the impact of 4,624 pounds for the heavier pneumatic-tired vehicle. The lighter impact of the pneumatically-shod truck was found due to the extra cushioning of the pneumatic tires. The solid tires showed a deflection of but 1 inch as compared to 4¼ inches deflection shown by the pneumatics.

The photographic record shows that the pneumatic tires absorbed most of the shock of the vertical drop, the truck leaving the ground only slightly, while the solid-tired truck bounded high after the impact. The recording device showed that the pneumatically equipped truck hit the ground less than two-thirds as hard as the other, greatly lessening strain on the chassis.

Results from these unique "movie" tests indicate that a 7½-ton truck on pneumatic tires would do less damage to roads than a 5-ton truck operating at the same speed and under the same rough road conditions.

The Functions of the Water Meter

One of the special features of "Watch Dog" meters, manufactured by the Gamon Meter Company, Newark, N. J., is the large disc and generous proportioning of moving parts, requiring slower movement of the disc in displacing a given amount of water, hence producing less wear and tear on the meter and adding to its life.

"Watch Dog" meters have been found to well fill the requirements and functions of reliable water meters. Meters of the disc or positive displacement type, as manufactured by this company, are claimed to have greater accuracy, simplicity of construction and characteristic durability. Another feature of the "Watch Dog" line is the frost-proof meter, the main casing of which is built of bronze, the walls being extra heavy, to which is bolted a galvanized gray iron bottom of such strength as to withstand ordinary pressure. Any unusual strength, however, such as occurs when the meter freezes, will break this frost-plate, release the mechanism and prevent distortion of the working parts. The measuring chamber of special bronze composition is accurately machined and provided with a three-piece disc, composed of a disc plate and two half-balls made from the highest quality vulcanized rubber obtainable. It is protected against fracture by a thrust roller operating in a channel milled in the measuring chamber wall. This prevents the disc from bearing or riding on the diaphragm or side walls of the chamber, thus reducing friction and retarding the destruction of the disc. In the average water meter one of the most frequent causes for complaint is the development of a leak in the stuffing box, which makes reading the meter difficult, if not impossible, unless the register box is removed. The elimination of this annoyance obviates the necessity of sending a man to inspect a meter "out of order" when the trouble is nothing more than a leak in the stuffing box—a defect which almost anyone can correct. As a solution of this problem, a stuffing box was designed that would become tight automatically; that would find its seat as soon as the pressure was put on. This is accomplished by cutting a rubber plug on an angle of 60 degrees and fitting it into a ground seat. Thus the stuffing box on a "Watch Dog" reaches a perfect adjustment almost as soon as the pressure enters the working parts. The saving thus effected in both time and labor is considerable.

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P&H
EXCAVATOR

POWER TRACTION
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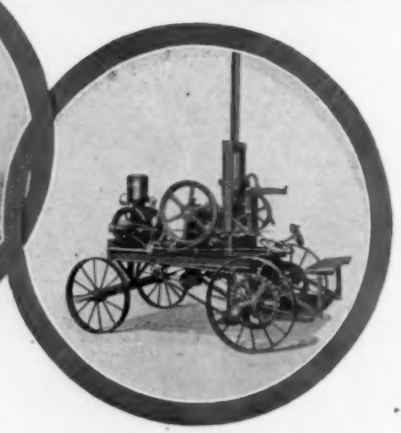

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P&H TAMPER

The purchase of a P & H Trenching Unit is a terse answer to the question of city trenching.

On city streets where work must be done with uniformity, and dispatch, the P & H combination —Excavator, Backfiller, and Tamper—is the logical equipment for the job.

Excavating: steady and fast with none of the irregularity and time consumption of human labor and at a cost that shows big in net savings.

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Tamping: Finishing up a good job by ramming the backfill back to stay and with no danger of settling pavement later.

Real facts and figures on P & H Excavating Equipment are waiting for you, let us give some interesting and valuable data,—send for Bulletin X and Bulletin IX.

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"You see them wherever you go, and they go wherever you see them"

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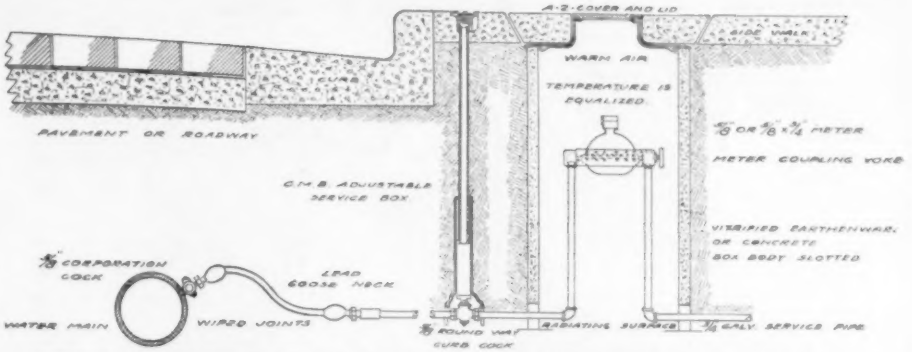

TYPICAL SATISFACTORY LAYOUT OF SERVICE LINE, COMPLETE FROM MAIN THROUGH TO HOUSE, SHOWING CURB AND METER BOXES

Standard Meter Housings

The diagram reproduced herewith shows a system of meter housing which admits of a uniform and systematic setting of meters of all sizes throughout the entire distribution system. It gives a sectional view of an ideal arrangement of a service line complete with meter in a solidly paved street and concrete sidewalks. The concrete covering over the lid, which is a special feature of the manufacturer, the H. W. Clark Company, 130 South Seventeenth Street, Mattoon, Ill., blends readily with the concrete walk, thus preventing any objectionable features in the installation. While retaining the uniformity of lid and locked construcion which is featured in this company's meter box, provision is made for access to the meter box through an opening of its full size, by the ready removal of the entire cover and lid with the concrete block which overlies them. This permits of making repairs to the bottom of the box without tearing up the street.

A HOUSING FOR LARGE AND SMALL METERS

The smaller illustration shown gives an idea of how large meters, regardless of size, are installed in Clark meter boxes. The meter "well" is of concrete block wall construction. The blocks may be made on the ground if desired, or the well wall may be built up of brick, or it may be made of solid concrete, using an iron collapsible form. The cover or top is made of an "adapter" of any size desired, a cover and lid. By changing the size of the "adapter" or cover and lid, all conditions as to size of meter, depth of setting, etc., are efficiently met. A line of heavy covers and lids is designed with an opening sufficiently large for a workman to enter the meter box without digging up the cover. The 20-inch lid has an auxiliary lid through which the meter may be read. Both lids have locking devices which prevent tampering with the meter by unauthorized persons.

Landscape Architects Move

Root, Hollister, Reeves & Harris, formerly located at 159 North State Street, Chicago, Ill., have moved their office to 8 East Huron Street, Chicago, to which address all communications with regard to services of these landscape architects and plant specialists should be addressed.

Interesting Problems of Consulting Engineer

Among the interesting problems now occupying the attention of J. W. Ledoux, 112 North Broad Street, Philadelphia, Pa., are the proposed improvements for the electric light and power station for the city of Jamestown, involving the installation of turbine-driven generators, boiler plant and building extensions, as well as the installation of pumping machinery, additional boiler facilities, air compressors, air lift, and buildings for the municipal water-works. Mr. Ledoux is also arbitrator in the case of the Long Beach Water Company, versus the Long Beach estates, Long Island, N. Y., and is connected with the Clear Springs Water Company rate case, the Norfolk County Water Company, Western New York Water Company, and others. Consulting work for the Wyoming Valley Water Supply Company, in connection with the valuation and establishment of rates and also for the construction of a reservoir and general improvemnts to the supply, is also occupying considerable time.

W. W. A. C. O. S.

Mr. CHAMBER OF COMMERCE SECRETARY!

The most valuable book in your reference library is the one which enables you to size up the sort of men who are succeeding in your chosen profession, and which furnishes up-to-date information as to the location of your friends and acquaintances in this field.

Such a book is found in "WHO'S WHO AMONG COMMERCIAL ORGANIZATION SECRETARIES."

Mr. MANUFACTURER!

Are you looking for an up-to-date list of Chamber of Commerce Secretaries?

If you want such a list corrected through April 15th, 1920, you can find it in "WHO'S WHO AMONG COMMERCIAL ORGANIZATION SECRETARIES."

Moreover, you will find in this interesting book much that will be of value in learning what sort of man it is who possesses such widespread knowledge of his community.

WHO'S WHO AMONG COMMERCIAL ORGANIZATION SECRETARIES

Up-to-date
Authentic
Covers United States and Canada

Alphabetical and Geographical Sections
184 pp., 5 x 7½, well bound
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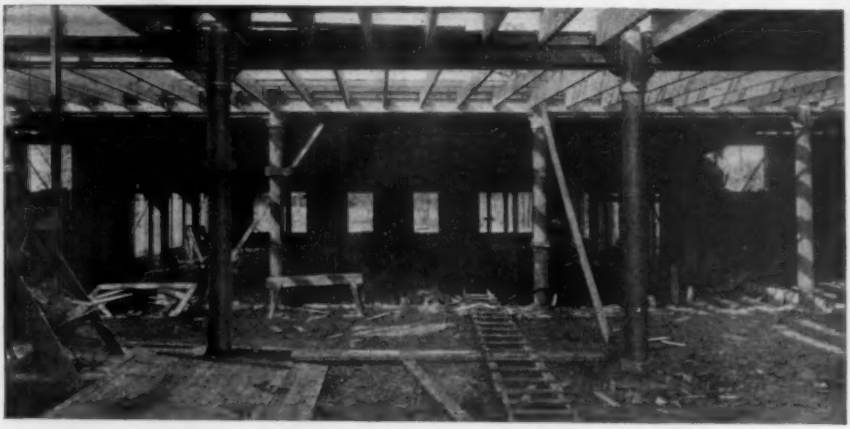
ORGANIZATION ACB SERVICE



Dependable Columns

Architects are securing them today by specifying permanent, fire resisting, rust-resisting KEYSTONE Cast Iron Columns.

These Columns stand the intense heat of fires and the shocks of falling walls with the greatest endurance. It is not uncommon, upon visiting the scene of a fire, to see the Cast Iron Columns as straight and dependable as they were before the fire, supporting the distorted and shapeless mass of steel work.

Owing to the fact that internal stresses in brackets are likely to lead to fractures, when hot columns are deluged with water, the caps and bases of KEYSTONE COLUMNS are *cast separately.*

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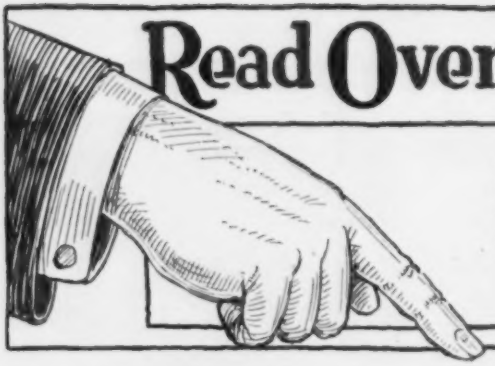
San Francisco—Monadnock Bldg.
Buffalo—957 E. Ferry St.

Read Over These Items



THE AMERICAN CITY should always be mentioned when writing for this material which is furnished free of charge. Officials who check over these items each month, and write for such printed matter as interests them, will find this a convenient way of keeping their information files up to date.

Clogged Water-Mains Cost Money.

Absolute proof that it is cheaper to have your water-mains cleaned than to run the risk of reduced fire pressure in time of need is given in the literature of the National Water Main Cleaning Company, Hudson Terminal Building, New York City.

Sanitary Drinking Fountains and Coolers.

Truly sanitary drinking fountains and scientific water coolers, including the newly developed Puro Liberty fountain, with its special features, are described in the latest literature of the Puro Sanitary Drinking Fountain Company, Haydenville, Mass.

Trustworthy Meters and Corporation Cocks.

Small pamphlets describing the type of water meters manufactured by the Union Water Meter Company, Worcester, Mass., as well as Bulletin No. 44, entitled "Corporations That You Can Trust," will be found interesting and valuable to the water-works official.

Small Motor Dump-Wagon for Road Building.

The Clark Tructractor Company, 1121 South Michigan Avenue, Chicago, Ill., has developed a small gasoline power truck which will haul concrete from mixers to the finished job, replacing wheelbarrows, hand carts and dump-carts. A complete description of this labor- and time-saving machine is supplied in literature which the above company will be glad to send on request.

"How to Get a Good Water Supply."

This is the title of an interesting 20-page booklet published by James P. Wells, Cutler Building, Rochester, N. Y., written particularly for municipal officials considering additions to a present water-supply or the seeking of a new one.

Long-lived Water Meters.

The literature of the Neptune Meter Company, 50 East 42d Street, New York City, describes in detail the development of the long line of successful Trident meters built for almost every class of service imaginable, which have always proved their value.

Meter and Valve Specialties—Manhole Covers.

Literature and data on meter boxes, curb boxes and non-rattling, adjustable manhole tops may be secured from the S. E. T. Valve and Hydrant Company, 452 Hudson Terminal Building, New York City.

Economy in Caulking Water-Mains.

The Leadite Company, 112 Broad Street, Philadelphia, Pa., will be glad to send to any water-works officials interested in economy and speed in caulking cast iron water mains, copies of its literature describing Leadite.

Compact Electric Sewage Pumping Station.

An interesting 8-page, 8½ x 11-inch pamphlet is published by Yeomans Brothers Company, 1417 Dayton Street, Chicago, Ill., entitled "Bulletin E-2100—Yeomans Duplex Electric Centrifugal Sewage Ejectors," which describes in detail methods for automatically raising sewage and drainage in basements below the street sewer level and taking care of the sewage from low districts of municipalities.

Motor Street Sweeper Catalog.

The Austin-Western Road Machinery Company, Chicago, Ill., issues an interesting illustrated catalog telling of the exclusive features of the Austin motor sweeper for efficient street cleaning.

Wood Pipe for Water-Mains.

The Western Wood Pipe Publicity Bureau, White Building, Seattle, Wash., will be glad to send literature regarding the advantages and dependability of redwood and Douglas fir wood pipe for water-mains.

Underground Cable for Street Lighting.

The Simplex Wire and Cable Company, 201 Devonshire Street, Boston, Mass., will send data regarding the use of Simplex steel tape cables, which do not need conduits and can be placed underground to supply street lighting units.

Solving the Water Storage Problem.

Municipal Catalogue No. 17, issued by the Pittsburgh-Des Moines Steel Company, 1007 Curry Building, Pittsburgh, Pa., contains valuable details regarding elevated steel tanks and stand-pipes for municipal water-supplies.

Street Signs—Official Badges—License Plates.

A very complete catalogue of number plates, street signs, inside office plates, official badges, license plates, dog tags, and card holders, is included in catalogue 25 AC 3, issued by the Niagara Falls Metal Stamping Works, 243 10th Street, Niagara Falls, N. Y.

Electric Control for Water-Main Valves.

Interesting facts regarding the value of the Dean control system for operating large valves on water-mains are included in a book entitled "Facts," which may be secured from George J. Kirkgasser, Cutler-Hammer Mfg. Company, Milwaukee, Wis.

Rubbish Boxes That Yield a Profit.

An interesting illustrated booklet giving data on how many cities have derived an income from the sale of waste paper gathered from street corner rubbish boxes manufactured by the Safety Sanitary Rubbish Box Company, Columbus, Ohio, may be secured from this company on request.

Listings of Second-Hand Machinery.

Municipal officials and engineers who are in the market for bargains in second-hand equipment can secure very complete and interesting lists of such equipment by writing to the Searchlight Department of the McGraw-Hill Company, Tenth Avenue and 36th Street, New York City.

Meters That Survive.

Data on some of the oldest meters manufactured by the Thomson Meter Company, 100-110 Bridge Street, Brooklyn, N. Y., as well as its latest literature describing the construction and cost of disc, current and duplex Lambert meters, may be secured from the above company.

Free Paving Literature.

Attractively illustrated booklets on Warrenite and Bitulithic pavements, giving details of construction and costs, may be secured from Warren Brothers Company, Boston, Mass. Address the Advertising Department.

Valves and Hydrants for All Pressures.

The second edition of Catalogue F, issued by the Rensselaer Valve Company, Troy, N. Y., contains complete descriptions of the interior working parts of all types of valves manufactured by this company, and also gives prices and data regarding Corey fire hydrants.

See additional items on page 6

The Short Wheelbase Proves Its Value

Loading in cramped coal mines, dumping from the end of a narrow pier, delivering coal direct to the bins inside a big plant, this Autocar and the three others in the Mudler fleet are daily proving the value of their short wheelbase construction. Under these exacting conditions they have developed within a few months a profitable hauling business for H. F. Mudler, of Hays Borough, Pa.

In June, 1919, he bought his first Autocar. This Autocar had earned enough by December to pay for itself and buy a second. On March 18th, a third Autocar was added, and a fourth in April.

The short wheelbase handiness of these Autocars has eliminated wheelbarrow handling and has done away with traffic obstruction that previously caused complaint.

Chassis (1½-2 ton)
$2300 97-inch wheelbase
$2400 120-inch wheelbase

THE AUTOCAR CO., *Ardmore, Pa.* Established 1897

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Represented by these Factory Branches, with dealers in other cities

Autocar

Wherever there's a road

HOW THEY DO IT IN OTHER PLACES

Valuable illustrated material as mentioned below will be sent free of charge if you mention THE AMERICAN CITY

Metal Lath for Floors, Roofs and Walls.
A complete indexed book of descriptions, specifications and uses of Hy-Rib metal lath, may be secured from the Truscon Steel Company, Youngstown, Ohio. This company also manufactures bars for the protection and reinforcement of concrete curbs.

Non-pulsating Well Pump.
The Pomona pump, which is non-pulsating and is suitable for deep and shallow well service, is described in literature published by the manufacturers, the United Iron Works, Inc., Kansas City, Mo.

Illustrated Valve and Fire Hydrant Catalog.
A 150-page illustrated catalogue showing all types of valves and fire hydrants made by the Ludlow Valve Manufacturing Company, Troy, N. Y., may be secured by water-works superintendents and other interested officials.

How to Design and Equip Playgrounds.
If you are interested in securing valuable data and illustrated catalogues regarding the design and equipment of playgrounds write to Hill-Standard Company, 733 Conway Building, Chicago, Ill.

Protecting Health in California.
This is the title of a very interesting folder recently issued by Wallace & Tiernan Company, Inc., 349 Broadway, New York, dealing with the methods by which California is stamping out water-borne diseases and sterilizing its water-supply. Data are given comparing the number of typhoid fever deaths in 1906 and 1918.

Triple Mowers for Parks and Golf Courses.
The triple mower manufactured by the Shawnee Mower Company, Shawnee-on-Delaware, Pa., which may be drawn either by light tractor or by horse, is described and illustrated in a booklet available for park superintendents and other municipal officials.

How to Select Outdoor Drinking Fountains.
The Murdock Mfg. & Supply Company, 427 Plum Street, Cincinnati, Ohio, has published a remarkably interesting 50-page pamphlet, giving important information regarding the choice and care of outdoor drinking fountains.

Computing Machines for Municipal Engineers.
Engineers' Bulletin A5, published by the Marchant Calculating Machine Company, Oakland, Calif., tells how engineers can readily compute excavations, fills and areas, as well as other technical details with the machine manufactured by this company.

Catalogs on Meter Specialties.
The H. W. Clark Company, 130 S. 17th Street, Mattoon, Ill., has just issued a new catalogue, No. 20, for those interested in water-works specialties. Particular attention is paid to meter boxes for housing any size and type of meter.

Steel Forms for Culverts, Sewers and Drains.
Bulletin No. 49, published by the Northwestern Steel & Iron Works, Eau Claire, Wis., describes in detail the advantages of steel forms for the construction of concrete culverts, sewers, drains, tiles and other similar work.

Concrete Enclosure Walls.
An 8-page bulletin and two 15 x 20-inch service sheets, devoted to the subject of enclosure walls, may be secured from the Alpha Portland Cement Company, Easton, Pa., free of charge to those living east of the Mississippi. A charge of 50 cents will be made for service sheets sent to those further west.

Speedy Hoists for Dumping Trucks.
Illustrated Circular No. 97, describing the Columbian lightning hand hoist for motor truck dump bodies, may be secured by writing to the Columbian Steel Tank Company, 1519-1625 West 12th Street, Kansas City, Mo.

Water Meters Find the Leak.
The Detector Meter manufactured by the Hersey Manufacturing Company, East and 2d Street, South Boston, Mass., has met with almost universal approval. If you are interested, complete descriptive catalog will be sent on request.

Motor Trucks with In-Built Quality.
Complete data and specifications covering the use of Selden trucks for general hauling, as well as for construction work for municipalities, may be secured from the Selden Truck Corporation, Rochester, N. Y.

Literature on Filter Alum.
The valuable qualities and strength of Harrison Filter Alum, manufactured by E. I. Du Pont De Nemours & Company, Wilmington, Del., are described in literature which will be forwarded to interested parties.

Handy Tables for Road Work
The Barrett Company, 17 Battery Place, New York City, has recently issued an interesting little road book for highway engineers, contractors and road builders, containing correlated data on highway construction and resurfacing with road tar.

Savings Through Sewer Cleaning.
P. J. Healey, 41 Cortlandt Street, New York City, will be glad to send you a complete description of the Healy Sewer Cleaning Machine, which has proved so useful in a number of cities in removing obstructions from clogged sewers.

Flushers Help Keep Streets Clean.
The advent of the motorized street flusher has done much to improve street cleaning. The literature of the Federal Motor Truck Company, 34 Federal Street, Detroit, will give you much information regarding the service of Federals in this and other branches of municipal work.

Forty-Four Pages on Centrifugal Pumps.
The De Laval Steam Turbine Company, Trenton, N. J., has just issued a new catalog on De Laval centrifugal pumps, both single- and multi-stage. A copy of this new catalog B should be in the hands of every water-works engineer and superintendent, as well as other officials of municipalities.

Sewer Machinery and Handling Sewage.
Six catalogues issued by the Pacific Flush Tank Company, 4241 Ravenswood Avenue, Chicago, Ill., contain valuable information regarding automatic machinery for handling and disposal of sewage. These catalogues may be secured by sending your name and address.

High-Efficiency Steam Prime Movers.
The literature of the Nordberg Manufacturing Company, Milwaukee, Wis., will give you exceptionally interesting data on the efficiency of the Uniflow poppet valve engine, which has an exceptionally low steam consumption over a wide variation in loads.

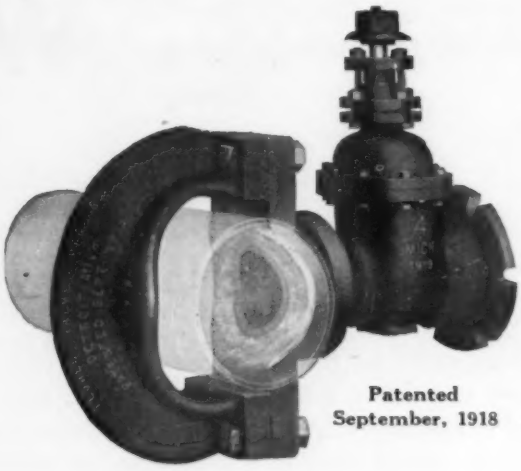
Automatic Traffic Posts.
If you wish to secure traffic posts for your city which will be within the spirit and letter of the law, write to J. H. Lehman, Elkhart, Ind., and ask for literature on his automatic traffic post, which will right itself if accidentally knocked over, and will cause no damage to the passing vehicle.

Help Your Street-Repair Gangs.
Maintenance heater No. 69 and patrol heater No. 68, manufactured by Littleford Brothers, 500 East Pearl Street, Cincinnati, Ohio, are fully described in literature which you may secure from this company. These machines are making repair work easier for maintenance and repair gangs in many cities and counties.

Long-Lived Corrugated Culverts.
The permanence and serviceable qualities of the round and half-round corrugated metal culverts manufactured by the Newport Culvert Company, 542 West 10th Street, Newport, Ky., are described in this company's literature.

Graphic Records and Spot Maps.
A free sample of map-pins and a catalogue of graphic charts available for health officers, superintendents of streets and other municipal officials may be secured from the Educational Exhibition Company, 327 Custom House Street, Providence, R. I.

See additional items on preceeding page



Patented
September, 1918

THE improved Flower sleeve speeds up the work by saving labor—by allowing the use of a shallower trench, by eliminating the slow, difficult job of pouring lead around the joint, and by simplifying caulking and reducing it to a minimum.

If you have not had particulars of this time, labor and money saver, send for them today.

Flower Valve Manufacturing Company

103 PARKINSON STREET **DETROIT, MICHIGAN**

(32)

What

FIRST COST

Cheapness of first cost has never characterized anything permanently worth while. If we had started in to see how cheaply we could build water meters twenty years ago, there would not be close to two million Trident Meters in service today.

Whether it be a water meter or any other piece of machinery, the purchaser who buys solely with a view to the price never obtains lasting satisfaction. Bending every effort to produce an article within a certain limit of manufacturing cost inevitably means the sacrifice of every other consideration to that end.

For that reason, it has always been our policy to see how well we could build Trident meters rather than how cheaply.

NEPTUNE METER COMPANY
50 EAST 42nd STREET, NEW YORK
CHICAGO · BOSTON · SANFRANCISCO
ATLANTA · LOS ANGELES · SEATTLE
PORTLAND · CINCINNATI
Makers of the Trident Water Meter

Is Economy?

MAINTENANCE

How much does it cost your Water Works System for meter maintenance?

Can one water works superintendent in a hundred refer to a systematically kept record of maintenance charges for his entire meter installation?

Maintenance charges are the best possible test of the value of a water meter.

What are the maintenance charges? Briefly, —the cost of inspection, repairs and replacements.

The reason Trident meters cost less in the long run is because the maintenance charges are almost negligible.

NEPTUNE METER COMPANY
50 EAST 42nd STREET, NEW YORK
CHICAGO · BOSTON · SANFRANCISCO
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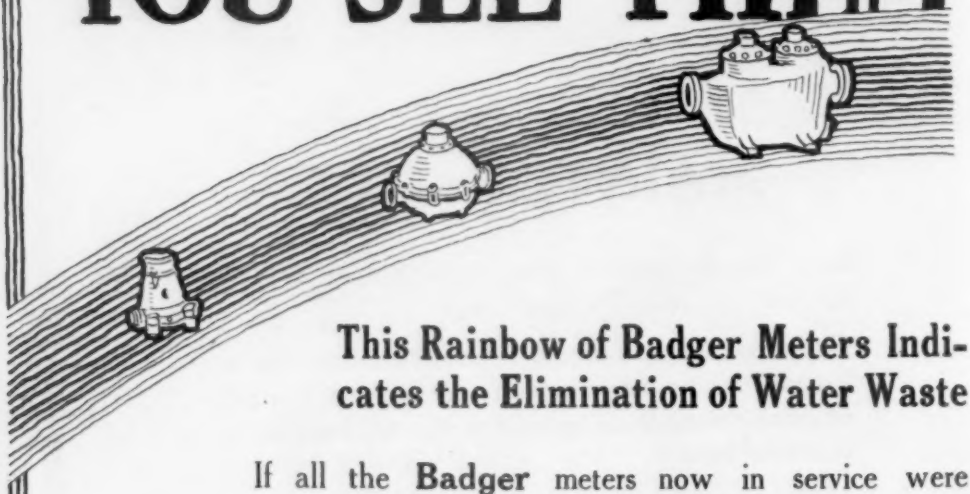
PORTLAND · CINCINNATI
Makers *of the* Trident Water Meter

YOU SEE THEM

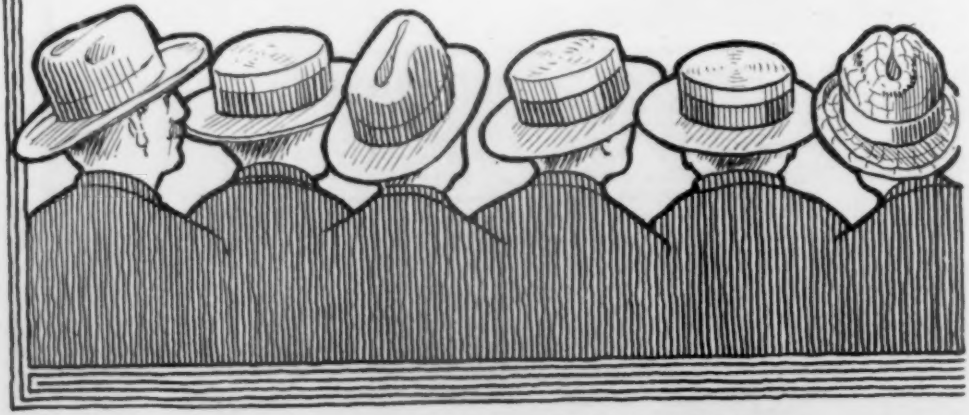


This Rainbow of Badger Meters Indicates the Elimination of Water Waste

If all the **Badger** meters now in service were fastened together, they would make a string as long as a huge rainbow—a rainbow full of promise and encouragement to water works officials who are desirous of doing away with the out of date and unbusinesslike "flat rate" system of selling water.

BADGER METER MFG. CO.

841-847 30th STREET MILWAUKEE, WISCONSIN



EVERYWHERE

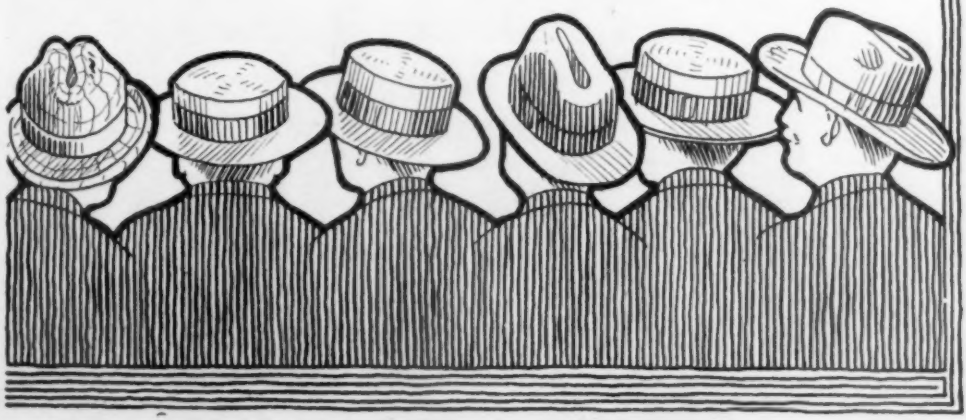
It Is Sheer Merit Which Has Been Responsible for Badger Popularity

In the old days when the **Badger Company** first started making meters, you used to hear a water works man say occasionally, "**Badger Meters**? Who ever heard of them? I never see **Badgers** anywhere."

Now-a-days it's a very different story. Merit has won out, and water works meter departments are proud of their **Badger** equipment. Now when **Badgers** are mentioned, the answer is "Oh, yes—they are the real thing. You see them everywhere."

BADGER METER MFG. CO.

841-847 30th STREET **MILWAUKEE, WISCONSIN**



Look Ahead!

Service Measured by Centuries

The CAST IRON PIPE
1 BROADWAY,

YOUR town of to-day will be the city of to-morrow.

Make a liberal allowance for this growth and install Cast Iron Pipe of ample capacity.

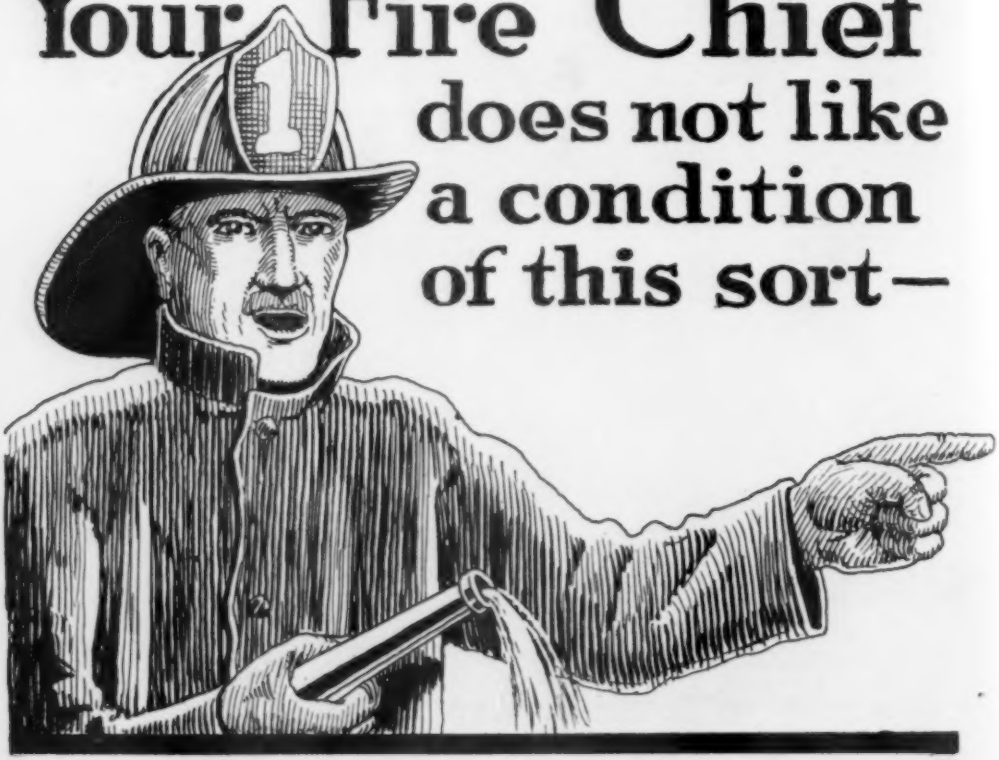
The only reason ever given for the replacement of Cast Iron Pipe in municipal service has been the out-growing of its capacity.

But, even when this condition arises, the pipe is never "scrapped"—it is taken up intact and relaid in some less populous section of the city.

Handsome cloth bound book—"Pipe and The Public Welfare" sent on request

PUBLICITY BUREAU
NEW YORK

Your Fire Chief does not like a condition of this sort—



EVERY water works superintendent realizes the importance of providing good pressure in the mains, in order that there may be no danger of widespread fire loss, due to the failure of the fire department to secure enough water, in case of emergency.

Many a fire chief has had the experience of answering an alarm and finding that on account of the clogged condition of the water pipe, it was impossible for the engines to obtain the necessary amount of water to extinguish the fire.

And the fire department heads are not the only ones interested in clean water mains.

Your health department appreciates just as keenly the importance of having the interior of the water mains kept free from sediment and filth. In fact, there is no one in your whole city who does not have a personal interest in the subject of water main cleaning.

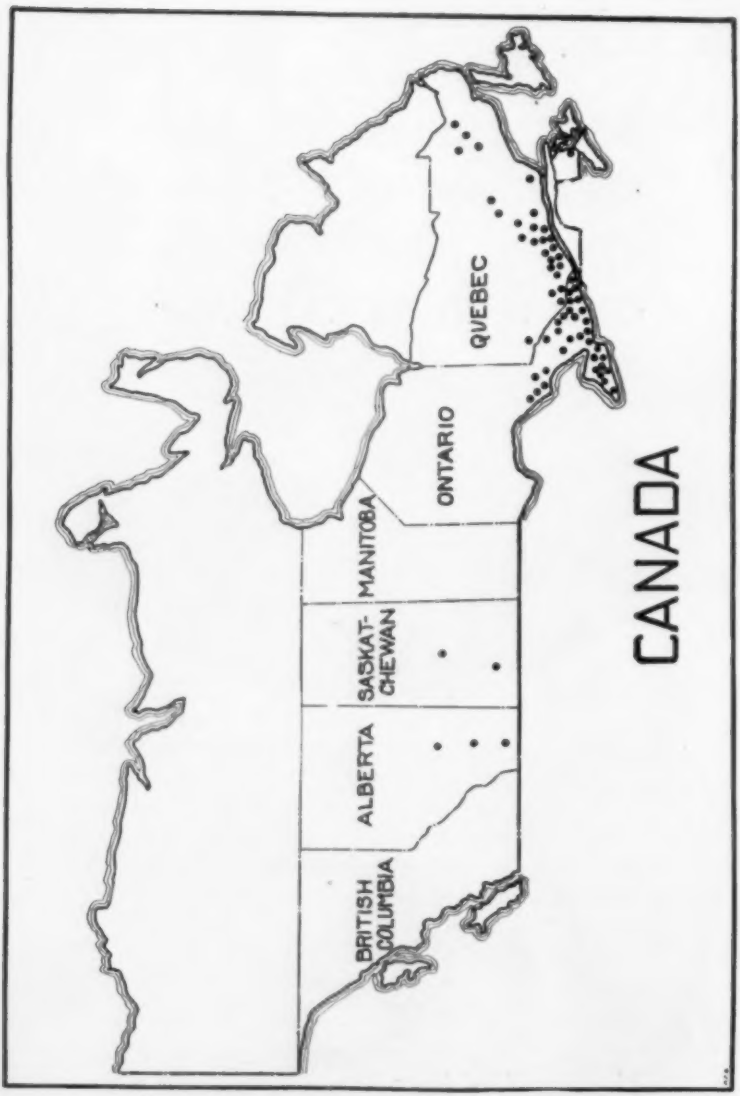
We have published an interesting booklet on the subject, which will be sent to anyone interested in eliminating filth from water mains.

National Water Main Cleaning Co.
Hudson Terminal Building
NEW YORK CITY

HELLO,

IS YOUR TOWN

TAKE ONTARIO



June, 1920

CANADA!

ON THE MAP?

FOR EXAMPLE

In 1908

Thirty out of every 100,000 persons in the province of Ontario died from Typhoid Fever.

In 1908 there was no Chlorine Control Apparatus to sterilize drinking water.

In 1918

There were forty-two installations of Chlorine Control Apparatus sterilizing drinking water in the state, and the number of deaths from Typhoid Fever in every 100,000 persons *had dropped to seven.*

Twenty-three lives saved in every 100,000—over five hundred lives saved from death by Typhoid Fever in ONE YEAR in Ontario alone!

This reduction has largely been accomplished by the sterilization of drinking water by Liquid Chlorine, and in this "W & T" Apparatus has played the leading role.

Installations of Chlorine Control Apparatus are shown on the opposite page.

Hundreds of progressive communities, realizing that no water supply—from whatever source it may be obtained—is safe unless it is sterilized, are protecting the health and lives of their residents by sterilizing their water supplies with LIQUID CHLORINE and "W & T" Apparatus. (Cost—17 to 50 cents per million gallons)

Is Your Town on the Map, Canada?

"W & T" Apparatus applicable to any water supply.
Interesting literature free on request.

Wallace & Tiernan Co., Inc.

New York City

Philadelphia Chicago San Francisco Pittsburgh
Dallas Kansas City Atlanta

CANADIAN REPRESENTATIVES: The General Supply Company of Canada, Limited, Ottawa

Chemicals for Water Purification

We manufacture the highest grades of

Sulphate of Alumina

Chloride of Lime

and

Liquid Chlorine

PENNSYLVANIA SALT MFG. CO.

WIDENER BLDG. :: :: PHILADELPHIA, PA.

"Liquid EBG" Chlorine

The 100% Efficient Sterilizing Agent

For the Chlorination of Water Supplies and the Disinfection of Sewage

A product of unvarying reliability —a gas entirely free from any foreign impurities.

"E. B. G." SERVICE has been developed to match the high quality of E. B. G. Liquid Chlorine.

We invite your inquiries and request for latest booklet.

ELECTRO BLEACHING GAS COMPANY

Pioneers and Leading Manufacturers of Liquid Chlorine

PLANT: NIAGARA FALLS, N. Y.

Main Office:

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Chicago Office: 11 So. La Salle Street

Southwestern Representative:
David Morey, Jr., 507 Scollard Bldg., Dallas, Texas

Canadian Representatives:
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Ottawa — Toronto Montreal Winnipeg Vancouver

HARRISON
CONCENTRATED FILTER
ALUM

The Highest Grade of Sulphate of Alumina for Water Purification

HARRISON CONCENTRATED FILTER ALUM, containing 22% AL_2O_3 (equivalent to 72% Sulphate of Alumina) is a highly concentrated product, of which we are the original manufacturers, made especially for use in mechanical filter plants.

The use of this product in your filtration process assures complete clarification and a corresponding decrease in the bacteria content under all conditions. Its high strength makes it most economical to use and reduces cost of transportation to the minimum.

We also manufacture Filter Alum in all commercial grades, including 17% AL_2O_3.

DU PONT

E. I. du Pont de Nemours & Co.

INCORPORATED

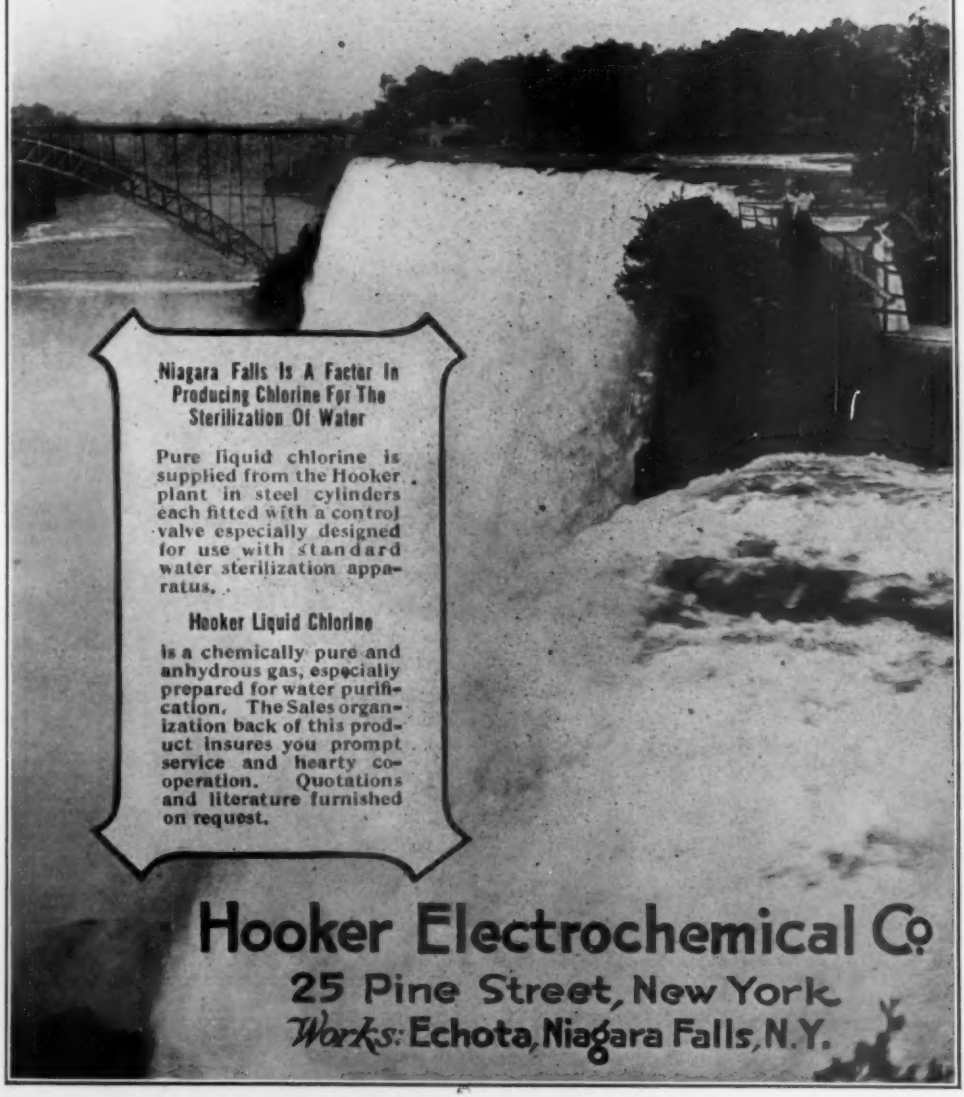
Sales Department: Acids and Heavy Chemicals Division

WILMINGTON, DELAWARE

BRANCH OFFICES:

New York Philadelphia Chicago Newark Columbus Boston

Hooker Liquid Chlorine
for Sterilizing Drinking Water.



Niagara Falls Is A Factor In Producing Chlorine For The Sterilization Of Water

Pure liquid chlorine is supplied from the Hooker plant in steel cylinders each fitted with a control valve especially designed for use with standard water sterilization apparatus.

Hooker Liquid Chlorine

is a chemically pure and anhydrous gas, especially prepared for water purification. The Sales organization back of this product insures you prompt service and hearty co-operation. Quotations and literature furnished on request.

Hooker Electrochemical Co

25 Pine Street, New York

Works: Echota, Niagara Falls, N.Y.

"WATCH DOG" WATER METERS

INCREASE EFFICIENCY

MAINTAIN REVENUE

Over 500,000 in service

DISC, CURRENT and COMPOUND TYPES

Catalog sent on request

GAMON METER COMPANY

282-296 SOUTH STREET, NEWARK, NEW JERSEY

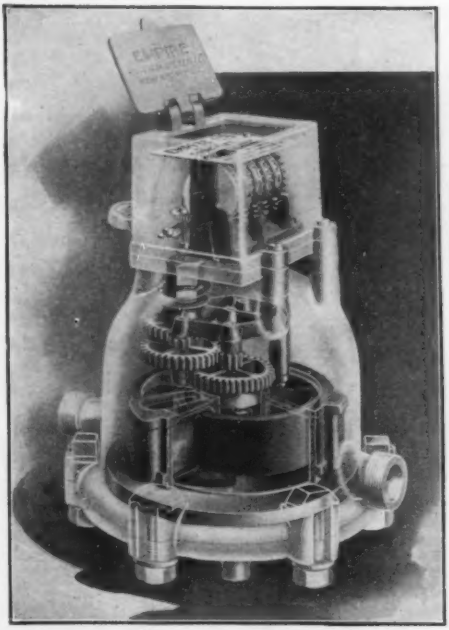
FIFTY YEARS

have been steadily devoted by us to seeking, attaining and maintaining

WATER METER PERFECTION

Our half a century of experience is quite at your service, and our engineers are ready at all times to give your particular meter problem individual attention.

CROWN
NASH
GEM
EMPIRE
EMPIRE-
COMPOUND
PREMIER



A
SUITABLE
METER
FOR
EVERY
KIND OF
SERVICE

THE EMPIRE METER

illustrated above, has a record for accuracy and low upkeep cost that will well repay the fullest investigation. Simply send postal for details.

NATIONAL METER CO.

Established 1870 **299 Broadway, New York**

BRANCHES IN ALL OTHER PRINCIPAL U. S. CITIES, ALSO WINNIPEG AND LONDON

Culver Military Academy Swimming Pool

R. U. V. Sterilizers at Culver Military Academy

CULVER MILITARY ACADEMY, Culver, Ind., is second only to West Point in standing and equipment. It is especially noted for its exceptional physical training—an important feature of which is its splendid swimming pool. This pool is equipped with four R. U. V. (Ultra Violet Ray) Sterilizers which —in conjunction with a Circulating System—keep it in the highest possible state of sanitation.

R. U. V. Sterilization is obtained without the use of chemicals or gas and does not change taste, temperature or color of water. Simple, safe, dependable and *economical* in operation.

We have had many years' experience in designing swimming pool apparatus with a special view to the proper heating, filtration and circulation of the water. Our Engineering Department will be glad to offer suggestions or make plans for the individual problems brought to our attention.

Address Department "J"

The R-U-V Company, Inc.

165 Broadway New York City.

McNUTT Meter Setting Specialties

McNutt Meter Box Cover
The Original Hinged Lid

McNUTT Equipment practically eliminates trouble, and reduces repair bills to the lowest point. Water works superintendents use and recommend McNutt Meter Equipment because it stands the tests of hardest service. Superior design and construction insure maximum efficiency, minimum expense and longest usefulness.

McNutt Yoke for Inside Setting

Complete information sent on request.

McNUTT METER BOX CO.

28 McNutt Bldg. Brazil, Ind.

Clark Water Works Specialties

Meter Boxes
Meter Couplings
Meter Yokes
Meter Testers
Service Boxes
Valve Boxes
Water Works Gauges
Inspectors Sets
Wireless Pipe Locators
Electric Indicators
Pressure Regulators
Air Relief Valves
Deep Well Pumps
Centrifugal Pumps

Manufacturers of Everything for the Water Works

The "CLARK METER BOX" developed through actual experience, perfected to the highest degree, has made good for over thirty years. It was first placed on the market in 1904, and throughout its use by thousands of water departments covering a period of over 25 years, the design has not been changed, as it has been thoroughly demonstrated in all of this service, that the CLARK METER BOX is correct. This applies to the various sizes used and recommended; the height of throat, the overlapping lid, and most important, the wonderful CLARK lock, conceded to be the only correct locking device for this type of service. The frost protection features of the "CLARK METER BOX" have been marveled at by Water Works people generally, the meter being safe from frost therein without resorting to the use of any filling in of box, auxiliary lids, etc.

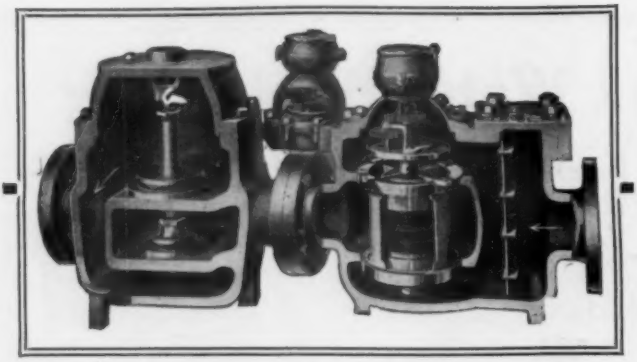
The "CLARK METER BOX" is now made in over 100 different models, and sizes, in addition to the popular first sizes submitted to the trade, thus fitting installation conditions in every climate. It cares for the largest size meters as well as the smallest; with the same uniform nanner of housing, thus facilitating the reading and care of the meter in service. The CLARK is the ONLY system that accomplishes this.

THE CLARK LINE has grown continuously, every article and appliance resulting from actual operating water works experience, thoroughly tested out in actual service, and offered to the trade not as an experiment but as a perfected money saver in every instance.

H.W.CLARK CO.

130 So. 17th St. Mattoon, Ill, U.S.A.

NEW YORK BUFFALO MEMPHIS SALT LAKE CITY SAN FRANCISCO CHICAGO



Nilo Compound Meters are different–

The Nilo Compound Meter is recommended by water works officials thruout the country for its correct principle in water meter construction, and is adaptable for measuring smallest flow to maximum capacity of pipe.

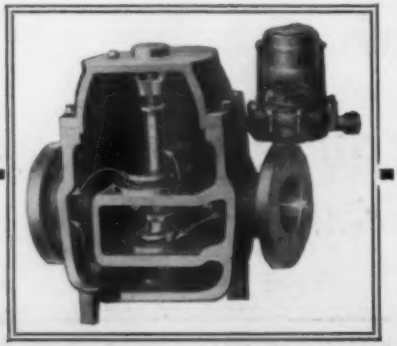
Meters which are at present on service lines can be compounded by attaching the Union Compounding Valve making a complete unit as shown in the above cut. The Union Compounding Valve may be attached to any make of meter in service.

Write for further details.

UNION WATER METER CO.

Makers of Approved Water Works Specialties
Since 1868

WORCESTER **MASS.**



LONG LIFE AND LASTING ACCURACY

the Ideal in Water Meters

LAMBERT DISC, CURRENT AND COMPOUND METERS

Approach The Ideal More Nearly Than Any Other Meters

When meters stand the test of time and after twenty or more years of service show less than 1 per cent error you are well assured of the in-built quality.

Interchangeable Parts

All parts of LAMBERT meters are interchangeable, thus making for economy and ease of replacement.

Unbreakable Disc-Pistons

All disc-pistons are reinforced and made unbreakable to insure permanence and continuous service under all operating conditions.

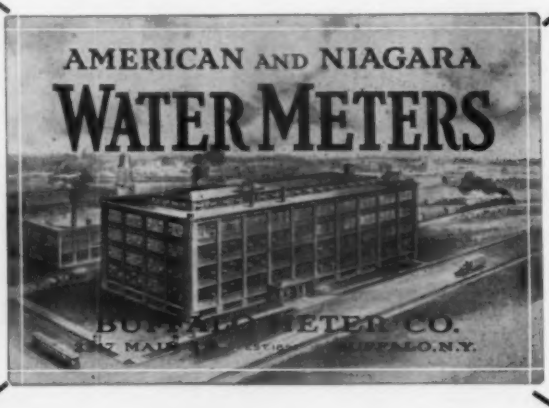
Materials and Workmanship

All materials and workmanship entering into the construction of the disc current and compound meters are of the best—the great reason for the long life and accuracy of Lambert meters.

THOMSON METER CO.

100-110 BRIDGE ST. **BROOKLYN, N. Y.**

UNIVERSALLY USED



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Security Sewer Rods

Security Rods are made from second-growth hickory, with malleable iron couplings swedged or shrunk down very tigh ly on the curved places at end of sticks. Security couplings *cannot* come off.

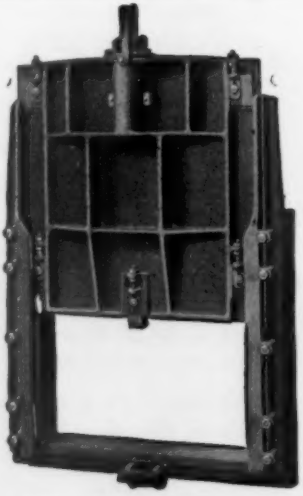
Joint and unjoint easily and quickly —light weight—long runs easily made. No slack but lend themselves to all practical bends.

They cannot buckle or uncouple in the duct.

Send for Flyer No. 16.

3-Foot Rods, $.65 each.
4-Foot Rods, $.75 each.

F. Bissell Company
226-228-230 Huron Street, TOLEDO, OHIO



Sluice, Head and Penstock Gates
Flap and Shear Valves

The kind that don't wear out

COLDWELL, WILCOX COMPANY
Water Street Newburgh, N. Y.

PITTSBURGH METER COMPANY

QUALIFIED BY MANY YEARS' EXPERIENCE IN METER BUILDING.

Quickly Dismantled or Assembled

The intermediate gear train and disc chamber, which are assembled and inserted in the casing as one unit, are free to be withdrawn, like the works of a watch, as soon as the bottom bolts are removed.

In the case of inspection or repair, and particularly when extreme cold weather causes breakage of the frost bottom and its consequent replacement, this construction saves the repairman's time.

Arctic construction saves you money the year around.

Pittsburgh Meter Company,
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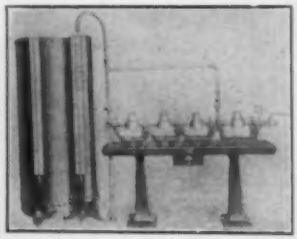
Sales offices

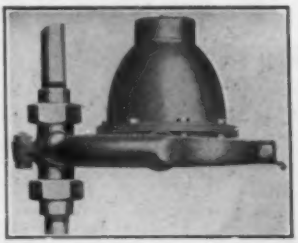
NEW YORK, 149 Broadway **CHICAGO, 5 So. Wabash Ave.** **KANSAS CITY, Mutual Bldg.**
COLUMBIA, S. C., 1433 Main St. **LOS ANGELES, Union Oil Bldg.** **SEATTLE, 802 Madison St.**

The Best in Meter Specialties



FORD WATER-METER TESTERS

This machine has been especially designed to supply the demand for a thoroly practical and comparatively inexpensive device that will test water meters accurately and rapidly. The Ford Testing Machine No. 4 is so arranged that one 1-inch or three ⅝-or ¾-inch meters may be tested simultaneously. The special features of this machine are, ease of adjustment for different sized meters, and the quickness and ease of placing meters in position.



"RAMS-HORN" METER HOLDING FRAMES

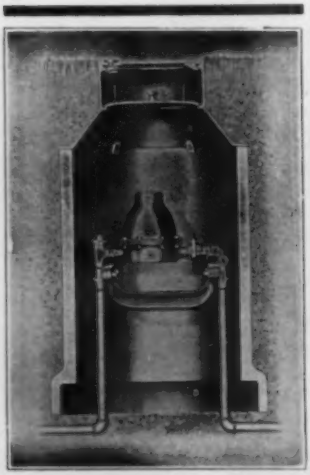
This meter holding frame is easy to install, cheaper than ordinary pipe fittings, takes any standard meter without adjustment and offers practically no resistance to the flow of water.

No nipples are required, thus making it a time-saver in setting meters. Each "Rams-Horn" is tested to 200 pounds pressure before shipment, thus insuring a perfect frame to all purchasers. Provision has been made so that the meter may be easily sealed in the frame to prevent tampering by consumers.

You cannot go wrong in using the tried and standard line of Ford Meter Specialties.

FORD ADJUSTABLE COUPLINGS

These couplings are designed for the quick installation of water meters in straight line pipes and overcome the great difficulties which are ordinarily encountered in the removal or exchanging of meters in service. In changing from one sized meter to another there has always been difficulty in getting the proper sized fittings, but the Ford Flexible Coupling makes these operations simple and easy. They may be used to equal advantage in general pipe work, steam, water, gas or air.



FORD METER BOXES

Located at the curb and equipped with the Wabash Double Lid Cover so there is no danger from freezing. The locking device protects the cover and meter from tampering and when unlocked raises the cover from its seat. Neither frost nor dirt will cause it to stick. The inner lid provides a dead insulating air space making the box practically frost-proof.

Water departments completely equipped with Ford Meter Specialties find many of their old troubles completely overcome. Only the best materials are used combined with first class workmanship.

Write today for our bulletins and pamphlets describing Ford specialties so that you may know more about their value.

Ford Meter Box Co.

WABASH **INDIANA**

Underground!

ENGINEERS SAVING WASTAGE OF WATER

New York Company Engaged in Stopping Hidden Leaks in Detroit Mains.

Locating and stopping hidden leaks in water mains is part of the water board's crusade against water wastage in Detroit. This work is being done in conjunction with meter installing program and will, according to water board engineers save the useless pumping of millions of gallons of water a year.

The leak locating survey which has been in progress for the last three months in being conducted by the Pitometer company, an organization of New York engineers.

Locate 11 Leaks.

Since the beginning of their work here the experts have located 11 leaks in the section bounded by Woodward avenue, Orleans street, Erskine street and the river. This district contains some of the oldest pipe in the city, many of the mains having been laid as early as 1849, nearly 70 years ago.

In checking over the 1,300 miles of water mains in this district two leaks that took more than 100,000 gallons of water a day have been found. One of these was in a four-inch line on Beaubien, between Jefferson and Woodbridge, where a leak was uncovered out of which water was spurting at the rate of 134,000 gallons every 24 hours, the other big leak was located at John R. street and Adams avenue, where 140,000 gallons of water were lost in a similar period. The total wastage for all the leaks located up to date is 645,000 gallons a day.

According to aMnager George Fenkell, of the water board, this is remarkably low wastage when the age of the pipe is considered.

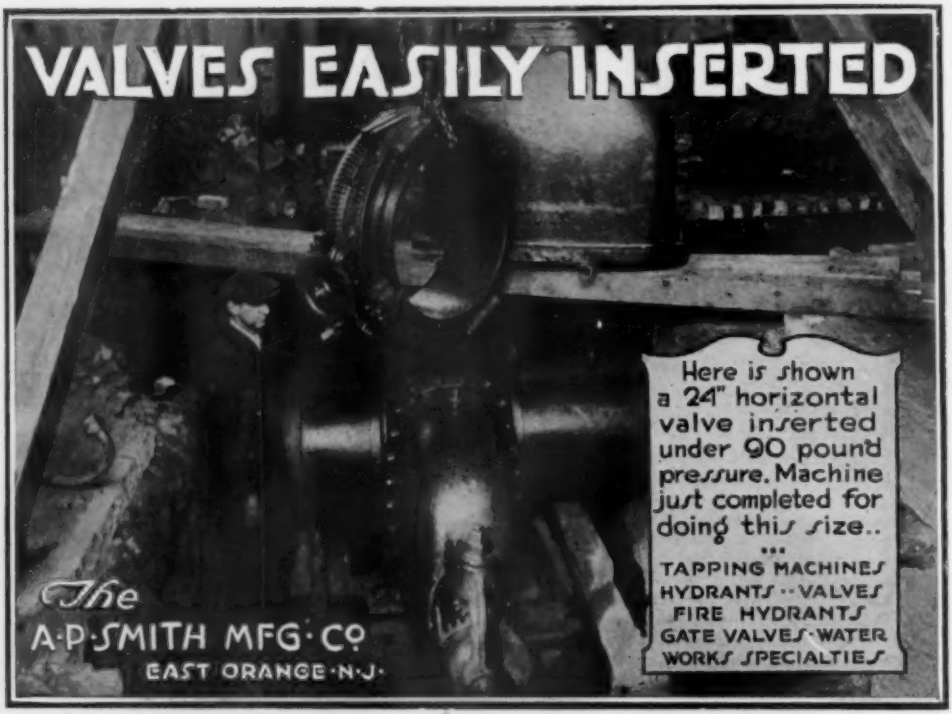
Water may be running to waste underground without your knowledge, as was the case in Detroit. A complete Pitometer survey by experts will determine for you the exact location and amount of leaks. Advice as to methods and costs will be furnished on request.

Send for Information

The PITOMETER COMPANY

55 Duane Street, New York

VALVES EASILY INSERTED


Here is shown a 24" horizontal valve inserted under 90 pound pressure. Machine just completed for doing this size..
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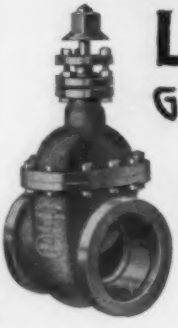
FIRE HYDRANTS
GATE VALVES · WATER WORKS SPECIALTIES
The
A·P·SMITH MFG·Co
EAST ORANGE·N·J·



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For Water, Steam, Gas, Oil, Hydraulic or Electric Operated.

All styles, any size, all pressures.

FIRE HYDRANTS

Frost-Proof, Simple-Efficient

All parts removable without digging up hydrant. Special device prevents street from being flooded should stand pipe be broken. Minimum expense to install and maintain.

Write today for illustrated catalog of our Valves and Fire Hydrants.

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TROY, N. Y.

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KENNEDY VALVES, HYDRANTS and WATER GATES

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IN ROPE FORM

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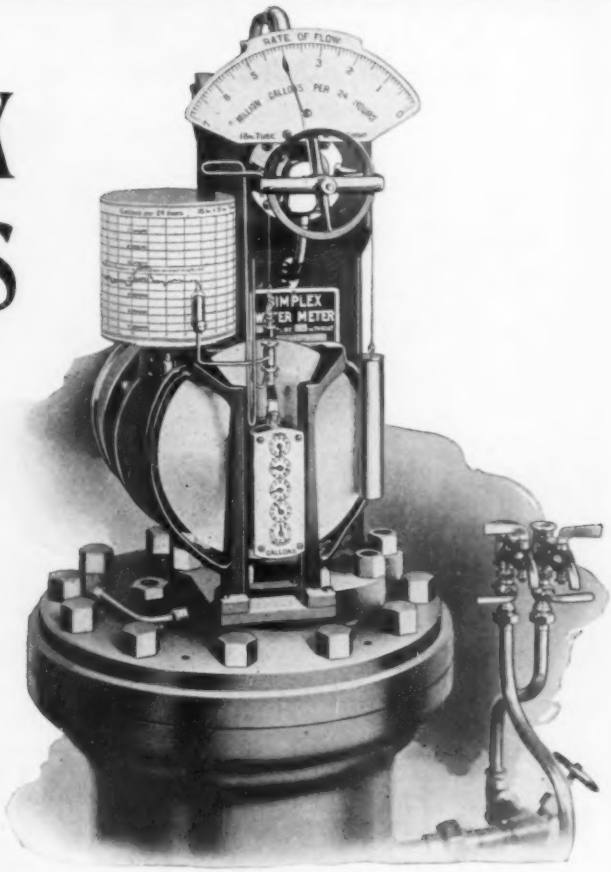
111 BROADWAY, N.Y. CITY

SIMPLEX METERS

MEASURE THE SMALLEST VENTURI HEAD



Water Meter for Venturi and Pitot Tubes

The Simplex Meter used with Venturi or Pitot tube, indicates, records and totals the flow of liquids. Its advantage is the ability to measure the most minute changes of flow even when the velocities are near zero. This fundamental superiority of the Simplex Meter is well recognized by those engineers and Water Superintendents who have our Meters in use and sent repeat orders.

The SIMPLEX meter Bulletin No. 113 gives the many other advantages. If you are interested in meters this will be of value to you. Get your copy today.

SIMPLEX VALVE & METER COMPANY

5722 Race Street, Philadelphia, Pa.

New England Representative—Geo. W. Stetson, 141 Milk St., Boston, Mass.
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Do You Throw Away a Faucet When the Washer is Worn Out?

Of course you don't—you simply put in a new washer, costing but a few cents.

It is the same with a Pratt & Cady Renewable Asbestos Disc Globe Valve. When the disc wears out you simply put in a new one at about 10% of the price of an entire new valve.

That saves buying a new valve, also the time and cost of tearing the valve out of the line. Without removing a P. & C. Renewable Valve from the pipe line, a new disc can be inserted in a few minutes.

Try a few Pratt & Cady Renewable Disc Globe, or Renewable Seat Gate Valves and prove to yourself that they will reduce your valve maintenance cost to a mere fraction of your present cost.

Made in Iron and Bronze in all standard sizes for every service.

Write for Valve Book To-day.

PRATT & CADY CO., Inc.

Boston, Chicago, Cleveland, Detroit, Hartford, Minneapolis, New York, Philadelphia, Pittsburgh, San Francisco

Representatives in all large cities

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Renewable Disc
GLOBE VALVES

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CENTRIFUGAL PUMPS

GAS HOLDERS

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CAMDEN, N. J.

A STEADY
Water Supply

with the Pomona double stroke, non-pulsating deep well pump, your pumping troubles are no more; your power expense less; your volume sure and greater.

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ALSO
MUNICIPAL
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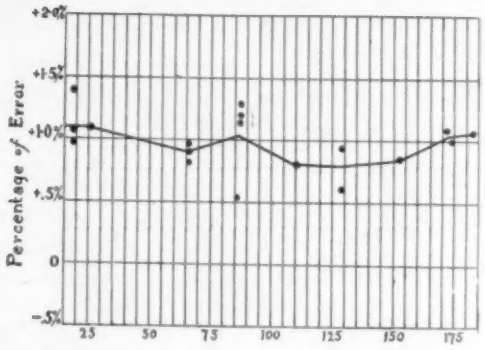
PLANTS

United Iron Works, Inc.
Gen. Offices, Kansas City, Mo., U. S. A.

BUILDERS VENTURI



Thousands of Pounds per Hour by Manometer

99% Accurate

A 5″ x 2″ Venturi Meter Tube with Manometer was recently drastically calibrated by Stone and Webster at the hydraulic laboratory of the Worcester Polytechnic Institute. The purpose was to find out the correction required by the Meter in a test for the Hartford Electric Light Company to determine if the expense of installing oil burning equipment was warranted.

The Meter calibration reproduced in chart form above, shows that the

VENTURI METER

required a correction of only a flat one per cent.

The Venturi Meter has proved equally accurate in water works service at St. Louis, Baltimore, Lancaster and other municipalities. That is why it is regarded as STANDARD EQUIPMENT in municipal service for measuring cold and hot water, sewage, gas, air, steam, etc.

With practically no permanent loss of pressure it affords a high differential for operating the Register, which is unusually rugged and accurate.

Literature describing the Venturi Cold Water Meter, the Venturi Rate of Flow Controller, the Venturi Hot Water Meter, or the Venturi for any other servcie will be forwarded on request.

Type M Register-Indicator-Recorder

Builders Iron Foundry

"Builders of the Venturi for 29 Years"

PROVIDENCE RHODE ISLAND

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PORTLAND, ORE. ATLANTA, GA. TORONTO, ONT. OTTAWA, ONT.

Healey Sewer Cleaning Machine
Saved City of Buffalo $35,000!

Buffalo wanted its sewers cleaned quickly, efficiently and at a reasonable cost. After careful investigation the Healey Sewer Cleaning Machine was used and at a saving of almost $35,000. The Healey Machine has been used in other cities with great satisfaction and great saving. It cleans sewers of all obstacles—stone, wood, dirt, sand, roots, etc., etc. It succeeds where others fail.

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They are Reliable When there is a FIRE

Rensselaer Improved "COREY" Hydrants are BEST

Send for Book 9.

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TROY, N. Y.

"COST MOST TO BUILD"

EDDY FIRE HYDRANTS
HAVE THE FOLLOWING POINTS OF SUPERIORITY:—

First:	General design.
Second:	Simplicity.
Third:	Durability—Thousands of these hydrants have been in use for a long period of time.
Fourth:	Efficiency—Less than one percent loss in pressure by friction and resistance.
Fifth:	Elimination of Water Hammer.
Sixth:	Positive drip.
Seventh:	Frost cases are unnecessary as all working parts can be removed through the standpipe.
Eighth:	Elimination of Water Damage. Entire standpipe can be broken off down to the valve and it will remain tight.
Ninth:	The stem rising through the stuffing box is a positive indicator.
Tenth:	Ease of operation.
Eleventh:	Working parts can be removed for examination by simply removing the cover.
Twelfth:	Quickness and ease with which it can be repaired.
Thirteenth:	All parts are carefully made to standards and are interchangeable.
Fourteenth:	The materials used are the best that money can buy.
Fifteenth:	Workmanship is of the finest and by experienced workmen.
Sixteenth:	All parts are machine finished.
Seventeenth:	Thoroughly bronze mounted.
Eighteenth:	Strength—All parts are made extra heavy and strong to stand rough usage.
Nineteenth:	Safety—Can be safely operated by any one and can be relied upon in emergencies.

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CHECK VALVES
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Made in Standard
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Frost-Proof—
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Always Dependable

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"REDUCED" Fittings

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Ferrosteel Gate Valves

may be repacked while under pressure.

Tested to 2000 pounds hydraulic pressure.

These valves are made with or without by-pass; the body is very heavy and has extra heavy hard metal seats which are screwed against shoulders in the body; making tight joints. The seats can be removed at any time, should it be found necessary to renew them. Wedge gates are very rigid and faced with hard metal.

Recommended for cold water or oil working pressures as follows:

1½ to 2½"	1200	pounds hydrostatic.
3" and 4"	1000	" "
5" to 12"	800	" "

1855—**CRANE CO.**—1920

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Branches in 56 leading cities.

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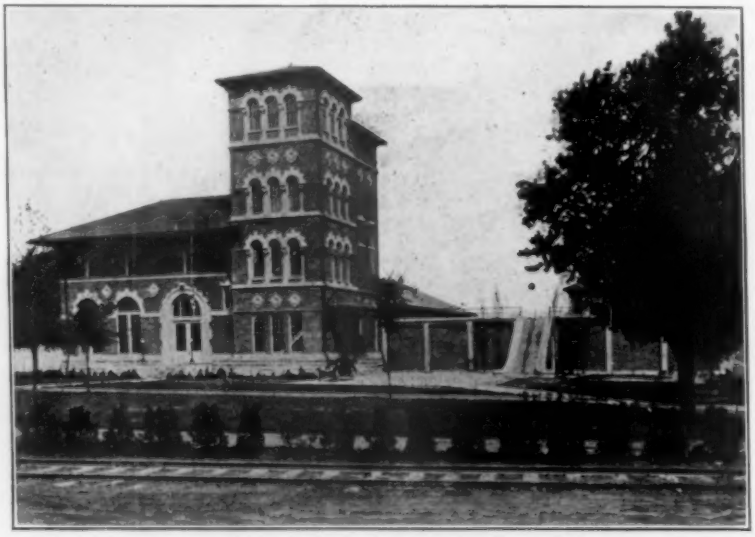

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A SPECIALTY

To Meet Every Requirement.

The Vivian Rate Controller

RE-FILTRATION SYSTEMS

FOR NATATORIUMS

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NORWOOD ENGINEERING COMPANY

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Member of Associated Manufacturers of Water Purifying Equipment

3 Pittsburgh Products for Your Water Works

This is the **Pittsburgh Recording Meter.** It keeps an accurate record, on a direct reading chart, of your pumping and distributing systems. It indicates the existence of any avoidable waste. Every water works department should have among its equipment the Pittsburgh Recording Meter.

HEAVY OIL ENGINE

Years of experience are back of each **Pittsburgh Engine.** They can be depended upon to be on the job day and night, without any trouble whatever. Write us for prices and descriptive matter. Power produced at ¼ to ½ the cost of coal.

MODERN FILTER PLANTS

The **Pittsburgh Filter Plants** supply 850,000,000 gallons of pure water to over 230 cities. It's the economic and positive way of securing pure water for your city. Write us for further details.

Pittsburgh Filter & Engineering Co.

Pittsburgh, Pa.

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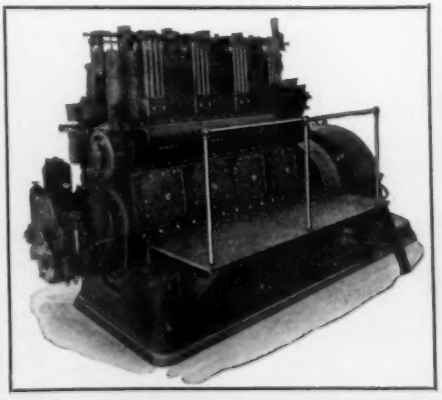
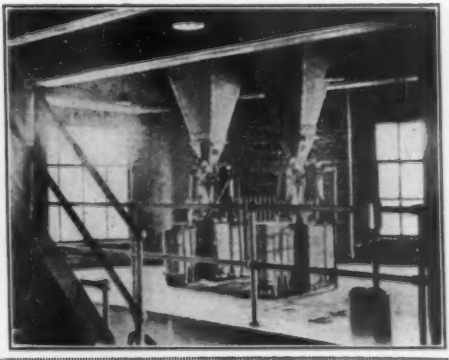


The Dry Feed Method



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Gravity and Pressure Filters, and Chemical Feeding Devices
Including Dry Feed Machines

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Original installation made in 1913, capacity 20,000,000 gallons daily

Plant increased 50% within 4 years, testifying to the merits of the **WHEELER FILTER BOTTOM.**

Total Daily capacity our municipal filtration plants **One Billion** gallons, supplying 500 communities.

Write for bulletin 1-20

The New York Continental Jewell Filtration Co.
General Office and Works: NUTLEY, N. J.

NEW YORK CHICAGO MONTREAL

TRADE **"LEADITE"** MARK

REGISTERED U. S. PATENT OFFICE

NO CAULKING

12 Reasons why You Should Use It for Jointing C. I. Water Mains

1—**Durability.** **LEADITE** joints improve with age. **LEADITE** was tested out for ten years before it was placed on the market, and has now been commercialized for more than fifteen years, giving it a life of over twenty-five years.

2—**No Caulking.** **LEADITE** joints require no caulking because the **LEADITE** adheres to the pipe, making a water-tight bond.

3—**Comparative Quantities.** One pound of **LEADITE** is equivalent to four pounds of lead because **LEADITE** is so much lighter than lead.

4—**Labor Saving.** Saves caulking charges and digging of large bell-holes and reduces the cost of trench pumping to the minimum, facilitating rapid completion of the work.

5—**Cost.** With conditions normal, **LEADITE** saves 50 to 65 per cent. over lead, owing to the saving effected in material and labor. The saving is much greater at the present time.

6—**Tools.** As no caulking is required, fewer tools are needed.

7—**Transportation.** Considerable freight and hauling charges are saved because **LEADITE** is lighter than lead, and therefore you move only one-fourth the weight of jointing material.

8—**Electrolysis.** **LEADITE** resists electrolysis.

9—**Fuel.** Saves fuel because you melt only one pound of material instead of four and not half as much heat is required to melt **LEADITE** as is needed to melt lead. **LEADITE** will not explode or splutter when poured into wet or damp joints.

10—**Delivery.** We can make prompt shipments.

11—**Damage Suits.** Claims for damages caused by joints blowing out are prevented because **LEADITE** joints will not blow out under any pressure.

12—**Users.** Progressive water works all over the country use **LEADITE**, and thousands of miles of pipe jointed with **LEADITE** are in service. **LEADITE** is the pioneer self-caulking substitute for pig lead.

THE LEADITE COMPANY, Inc.

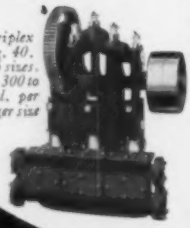
100 S. Broad Street, **PHILADELPHIA**

Deming

40th ANNIVERSARY YEAR

Master Pump Makers to the World

THE 40th year!—it represents a wealth of past achievements—it inspires toward new accomplishments. Forty years of study, forty years of experiments and 40 years of experience in each detail of pump design, pump construction, and pumping practice are an absolute guarantee of dependable service which can mean the end of further problems of pump selection.



Deming Triplex Pump Fig. 40. Built in 16 sizes. Capacities 300 to 70,000 gal. per hour. Larger size to order.

Complete Pump Book sent to any municipal executive on request.

THE DEMING CO., Salem, O.

Established 1880

"Over a 1,000 Hand and Power Pumps for all Uses."

Chicago: Henion & Hubbell — New York: Ralph B. Carter
Boston: Chas. J. Jager — Denver: Hendrie & Bolthoff
San Francisco: Crane Co.

THE MILLER AUTOMATIC SIPHON

6 Text book Catalogs on Sewage Disposal Apparatus

Sewage can be collected and disposed of in full agreement with sanitary regulations. Proper equipment for the work is available—and is fully described in these 6 Text Book Catalogs. Write us for the copies you can use.

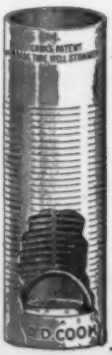
Catalog No. 15—Flush Tank Siphons. Water Regulators
" " 16—Automatic Siphons for Domestic Septic Tanks
" " 17—Pneumatic Sewage Ejection
" " 12—Sewer Pipe Joint Compound
" " 14—Automatic Siphons for Large Municipal Disposal Plants, etc.
" " 7—Imhoff Tanks. 2018-P

PACIFIC FLUSH-TANK CO.
SINGER BUILDING, NEW YORK
4241-3 E. RAVENSWOOD AVE. CHICAGO

B. M. E.

Sewer Cleaners never fail to sell themselves, recent testimonials show some unusual performances. We also make Sewer Traps, Street Flushers, Street Cleaners' Carts, Traffic Signs, Street name Signs and other equipment. Write for our literature.

THOMPSON-FLEMING, INC.
Formerly the
Buffalo Municipal Equipment Company
174-176 Ellicott St. Buffalo, N. Y.

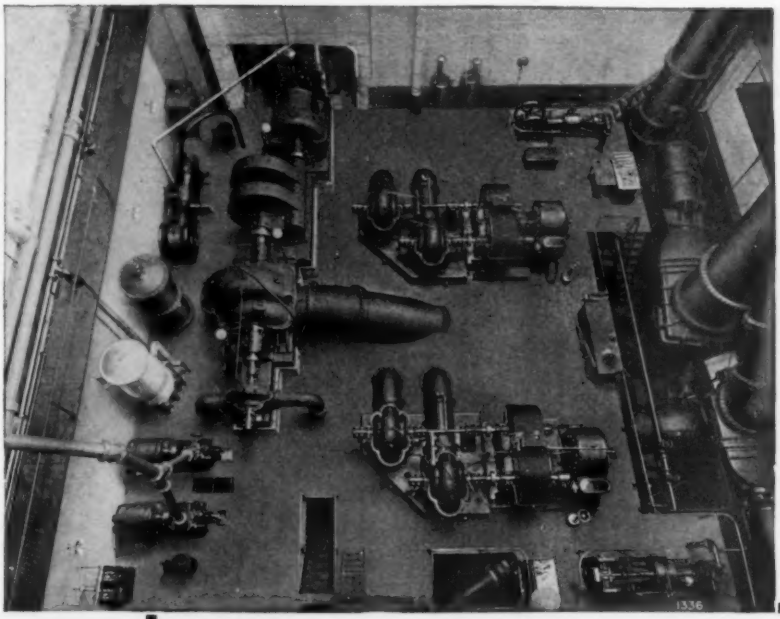


Eliminate sand from deep water wells with the

Cook Patent Brass Tube Well Strainer

Write for Bulletin 30.

A. D. COOK
Manufacturer of Deep Well Pumps and Strainers
Lawrenceburg, Ind.



Filtration Pumping Station, City of St. Louis

Some Years Ago

the City of St. Louis Bought Two

DE LAVAL PUMPS

of a capacity of 40,000,000 gallons each, driven by single-stage geared turbines, as shown in the above photograph. Recently greater capacity was required, and the De Laval 100,000,000 gallon per day geared steam-turbine-driven centrifugal pumping unit shown at the left side of the picture was purchased. The circulating pump for this unit is coupled directly to the main pump shaft.

All of these pumps discharge against 60 ft. head.

The tremendous saving in cost of buildings and foundations resulting from the use of centrifugal pumping machinery in this plant is apparent.

The steam economy of De Laval turbine-driven centrifugal pumps is equally remarkable.

State your conditions fully, and estimates upon which we are prepared to base guarantees will be given. Ask for catalog W-64.

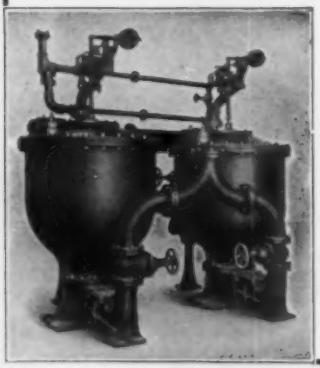
92

DE LAVAL STEAM TURBINE CO., Trenton, N. J.

SHONE SEWAGE EJECTORS

Endorsed by City Engineers in all parts of the United States

RELIABLE—SIMPLE—DURABLE



The Shone Ejector has an unequaled record of performance covering a period of thirty-five years.

Fifty-two Ejectors were used in the Chicago World's Fair Grounds 1893. In 1891 the City of Chicago installed six Shone Ejectors. These Ejectors are still giving perfect service.

SEND FOR COMPLETE BULLETINS

YEOMANS BROTHERS COMPANY
1417 DAYTON STREET CHICAGO, ILL.

Municipal Sewage Disposal
Industrial Waste Waters Treatment
Water Purification

Dorr Equipment and Appliances include the Dorrco Self Cleaning Screen, and the Dorr Sewage Clarifier, for continuous sedimentation and sludge removal. They offer in many cases a substantial reduction in installation and operating costs per unit of efficiency.

Dorr Processes include systems of industrial waste waters treatment. Plants of our design are successfully operating on many types of obnoxious wastes. In some cases, revenue is derived from the salvage of valuable materials.

Dorr Engineering Service provides for complete surveys to determine best method of treatment to meet local conditions.

Write us for information regarding the Dorr-Peck process of sewage treatment (modification of the activated sludge process.)

Inquiries are also solicited regarding all problems involving sewage and waste waters treatment, and water purification.

THE DORR COMPANY
Sanitary Engineering Dept.
DENVER 101 Park Avenue, LONDON
New York City

SEWER

The Kuhlman Sewer Cleaning Machine will solve your troubles. Our machine is second to none.

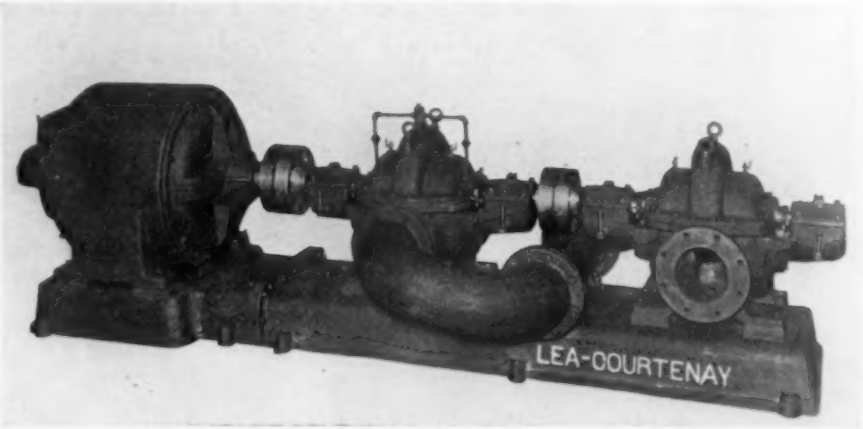
PREWAR PRICE HAS BEEN ESTABLISHED
which should interest city officials to purchase now instead of waiting.

CLEANING

Mail us your address so that we can send you pictures and explanatory matter showing how other cities are keeping their sewers in good shape with this sewer cleaner.

CHAMPION CORPORATION
338 Sheffield Ave.
Hammond Indiana

MACHINE



"Service Tested" Centrifugal Pumps

Every Lea-Courtenay Pump is tested before it leaves the factory under operating conditions exactly paralleling those it will meet in the service for which it is intended.

The pump shown here, one of three similar units recently supplied to the City of Norfolk, has a capacity of 2500 gallons per minute at 250 feet head, giving a maximum efficiency of 84%. This high efficiency proves that there is great economy in using two single-stage pumps in series. Due to the fact that pumps of this type are theoretically balanced for end thrust, the loss between pumps is negligible.

An added advantage is that there are no return passages and diffusion vanes to be cut by gritty water.

For the executive:

S-5 is a brief but comprehensive little book which will give you an idea of the many types and manifold uses of Lea-Courtenay centrifugal pumps. It is worth reading all the way through.

For the engineer:

H-4 is a complete description of the testing of Lea-Courtenay centrifugal pumps with data on double suction and uniflow types and installations. A copy will be mailed on request.

We have specialized for many years in the building of water works pumps and have many hundreds in service. We welcome the submission of pumping problems for solution.

LEA-COURTENAY COMPANY

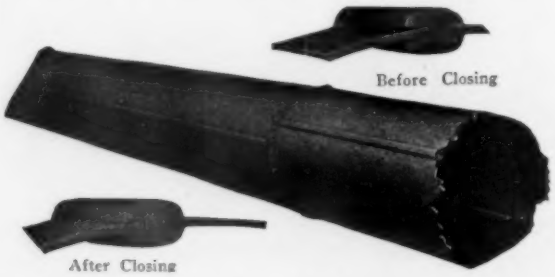
15 MAINE STREET **NEWARK, N. J.**

New York **Houston** **Atlanta** **Detroit** **Richmond** **Montreal** **Toledo**
Pittsburgh **Boston** **Pueblo** **Philadelphia** **Omaha** **Chicago** **Minneapolis**

2022-T

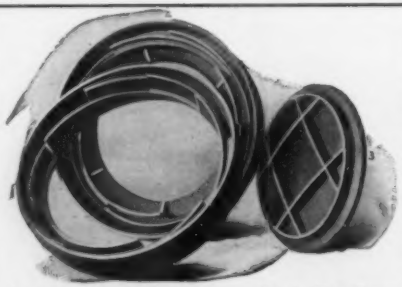
Increase the Capacity of Your Water Mains Install Lock Bar Steel Pipe and Reduce Friction

20" to 72"
LOCK BAR STEEL PIPE



has greater strength with less weight than any other kind of pipe. The protective coat on Lock Bar Pipe is applied at high temperature, making the pipe highly resistant to the corrosive action of water. Electrolysis is minimized because this steel pipe is a continuous conductor thus eliminating the necessity of costly bonding.

EAST JERSEY PIPE COMPANY
50 Church Street, New York City.



No. 1. Under Cover Frame. No. 2. Top Cover Frame. No. 3. Heavy Corrugated Cover.
Illustrated Booklet and Price List on Application.

NO MORE RATTLING COVERS

S. E. T. Adjustable Manhole Covers
DO NOT JUMP OR TILT — Non-Breakable

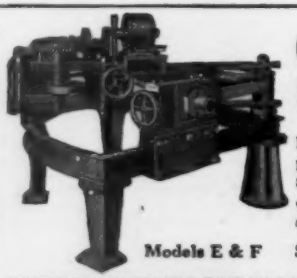
Scientifically Right—Quickly Adjusted to street grade changes at little expense. Replacement and maintenance costs reduced over one-half. Suitable for Brick, Concrete or our own cast iron manholes. Five years in actual service under heavy traffic conditions.

S. E. T. VALVE AND HYDRANT CO.
452 Hudson Terminal Building
NEW YORK

MANHOLE COVERS

SIZES FROM 12 TO 36 INCHES DIAMETER

MADISON FOUNDRY CO.
839 ADDISON ROAD··CLEVELAND,O.



Cold Pipe Benders

Benda all sizes of pipe from ⅛" to 8". Hand or motor operated. Standard of the world.

Models E & F — Send for catalog.

AMERICAN PIPE BENDING MACHINE CO.
14 Pearl Street, Boston, Mass.

State Capitol, Oklahoma City—UNIVERSAL PIPE Fire Protection Lines installed to protect this beautiful building.

FOR THE PAST 3½ Years NO OTHER PIPE *but* UNIVERSAL has been used in OKLAHOMA CITY for WATER SUPPLY LINES. 42,000 feet additional are now being installed.

In ever-increasing numbers are large and progressive cities utilizing the advantages of

UNIVERSAL PIPE

-cast iron pipe with iron to iron-*cast iron*-joints,

PERMANENTLY TIGHT AND FLEXIBLE

Will your next WATER SUPPLY LINE be made up with 'THE EFFICIENT PIPE'

THE CENTRAL FOUNDRY COMPANY

SALES OFFICES - NEW YORK, CHICAGO, SAN FRANCISCO, DALLAS, ATLANTA

Nearly 1000 miles of Pipe for Uncle Sam

Camp Lewis, one of the largest and most modern army cantonments ever constructed for the United States, was built as a permanent army post, so particular care governed the selection of pipe for its water supply system—wire-wound pipe being specified exclusively for both supply and distribution systems.

The case of Camp Lewis was duplicated throughout the entire country wherever a cantonment or camp that held any prospect of permanency was built—nearly a thousand miles of wire-wound wood pipe being ordered by the Government for them.

The favorable experience of the Government with wire-wound wood pipe is simply a reflection of that of organization, institutions, individuals and municipalities. When such factors as low cost—both initial and ultimate—exceedingly long life, uncommon capacity, unusual adaptability and speed and ease of line construction are considered, wire-wound wood pipe for many purposes has NO equal. The more common uses of wire-wound wood pipe include medium and small water supply lines; distribution systems; primary and secondary irrigation lines; medium and small hydro-electric developments; hydraulic and sluicing operations; drainage systems and storm sewers; household and farm supply systems.

The advice of the expert staffs maintained by the wood pipe manufacturers and this bureau, concerning the advisability of using wire-wound wood pipe for any specific purpose may be obtained for the asking.

If wire-wound wood pipe is the best pipe obtainable for your purpose you will be told so. If not, you will be told it is not—and just as frankly.

Wire or write us concerning your hydraulic problems.

WESTERN WOOD PIPE PUBLICITY BUREAU

White Building, Seattle, U. S. A.

Address all inquiries for details and prices to the following:

Pacific Tank and Pipe Company, San Francisco
Redwood Manufacturers Company, San Francisco
Continental Pipe Mfg. Company, Seattle
American Wood Pipe Company, Tacoma

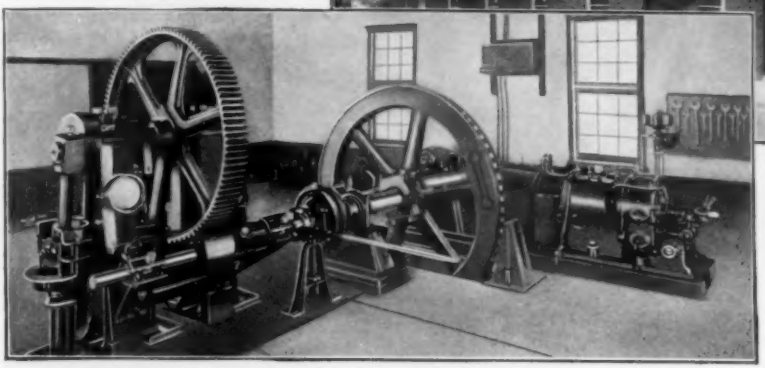
Redwood —— Douglas Fir

WOOD PIPE

CONTINUOUS STAVE-WIRE WOUND-BORED

When writing to Advertisers please mention THE AMERICAN CITY.

Municipal Water Works
Pumping Station,
City of Tarpon Springs, Fla.



Another Feather in Worthington's Cap

DOWN where Ponce de Leon hunted the fountain of perpetual youth, Worthington in 1915 installed a Deane 14 x 12 Triplex pump hitched to a Worthington Snow type 65 B.H.P. Crude Oil Engine.

Superintendent Harry McCreary says . . . "We have been entirely satisfied . . . we have never had any trouble to delay operation."

This apparatus, pumping 250,000 gallons of water every day, averaging seven hours' run and still going strong, seems to indicate that old Ponce wasn't far from the trail. It certainly proves that Worthington's "world's standard for pumps and pumping machinery since 1840" is a deserved title.

Other Worthington Products
Steam, Centrifugal,
Power and Water Works Pumps,
Air Compressors, Meters,
Condensing Machinery,
Oil Engines and Vacuum Pumps
Underwriter Fire Pump

WORTHINGTON PUMP AND MACHINERY CORPORATION
Executive Offices: 115 Broadway, New York City
Branch Offices in 24 Large Cities

PUMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

Duane Works, *Holyoke, Mass.* Epping-Carpenter, *Pittsburgh, Pa.* Laidlaw Works, *Cincinnati, Ohio.* Gas Engine Works, *Cudahy, Wis.*
Blake & Knowles Works *East Cambridge, Mass.*
Worthington Works *Harrison, N. J.*
Power & Mining Works *Cudahy, Wis.*
Snow-Holly Works *Buffalo, N. Y.*

Twenty-two Years of Service —and Still Good Pipe

Two dams were needed—but only one pipe line.

This Redwood stave pipe was laid in 1896 for the Cuyamaca Water Co., near San Diego, Cal. In 1917 a new dam had to be built but—THE SAME PIPE STAYED ON THE JOB.

This is a typical installation of Pacific Redwood Pipe.

Long life, resultant from the quality of materials, and workmanship that enter into its construction is characteristic of all Pacific Wood Stave Pipe.

We make wood pipe for all waterworks requirements. Write to our nearest office today.

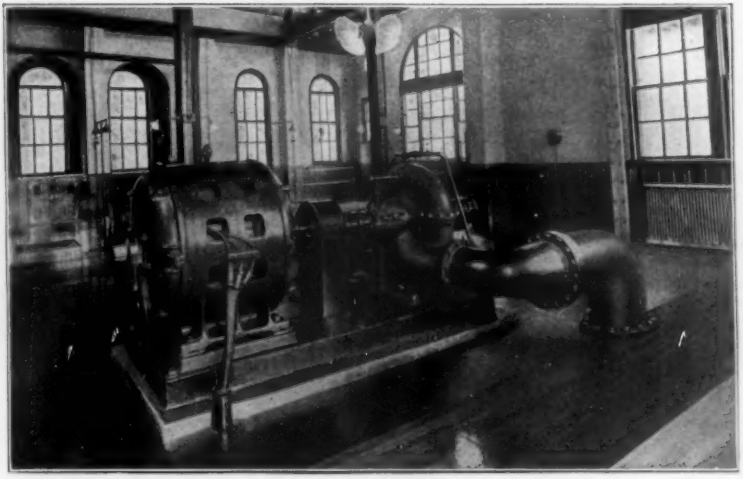
PACIFIC TANK & PIPE CO.

310 Market Street,
San Francisco, Calif.

909 Trust and Savings Bldg.,
Los Angeles, Calif.

NEW YORK CHICAGO PHILADELPHIA SALT LAKE CITY

SOLVING YOUR PUMPING PROBLEMS ELECTRICALLY

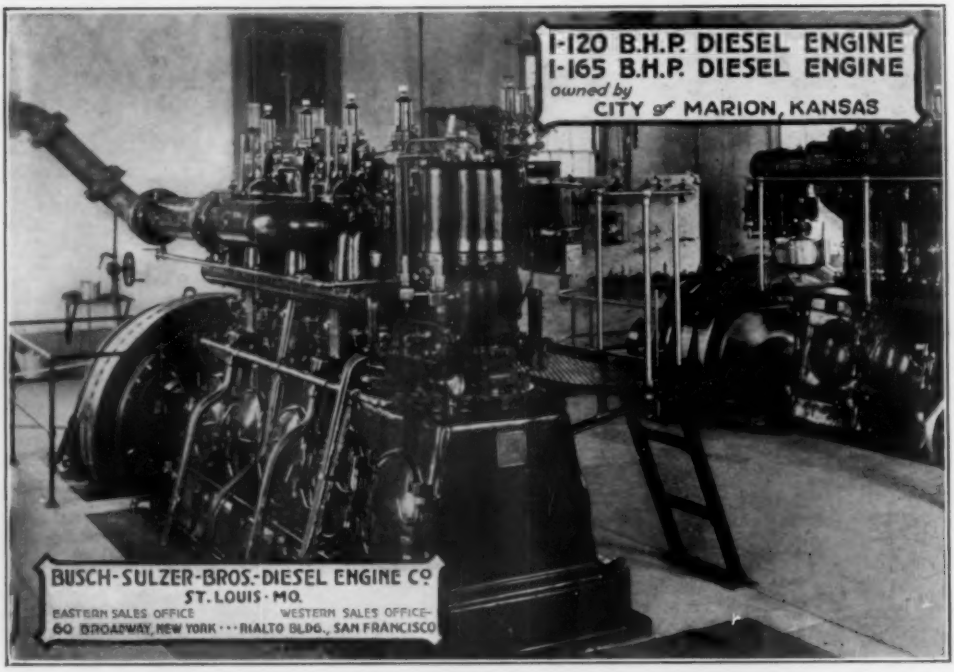


7,500,000 gallon per day Centrifugal Pumping Unit at City of Elmira, N. Y.

THE above cut shows an installation of a typical Allis-Chalmers pumping unit, both pump and motor being designed and built by the Allis-Chalmers Mfg. Co. The pump is a 12" Type "S" and the motor is a 300 H.P. Squirrel Cage, Type "AN."

If you are contemplating the installation of pumping equipment or are interested in the design of the latest types of centrifugal pumps it will be to your advantage to write for Bulletin No. 1632D which will be sent you free upon request.

ALLIS-CHALMERS MANUFACTURING CO.
MILWAUKEE WISCONSIN



517 G. P. M. Plenty of Water

JUST ONE of NINE

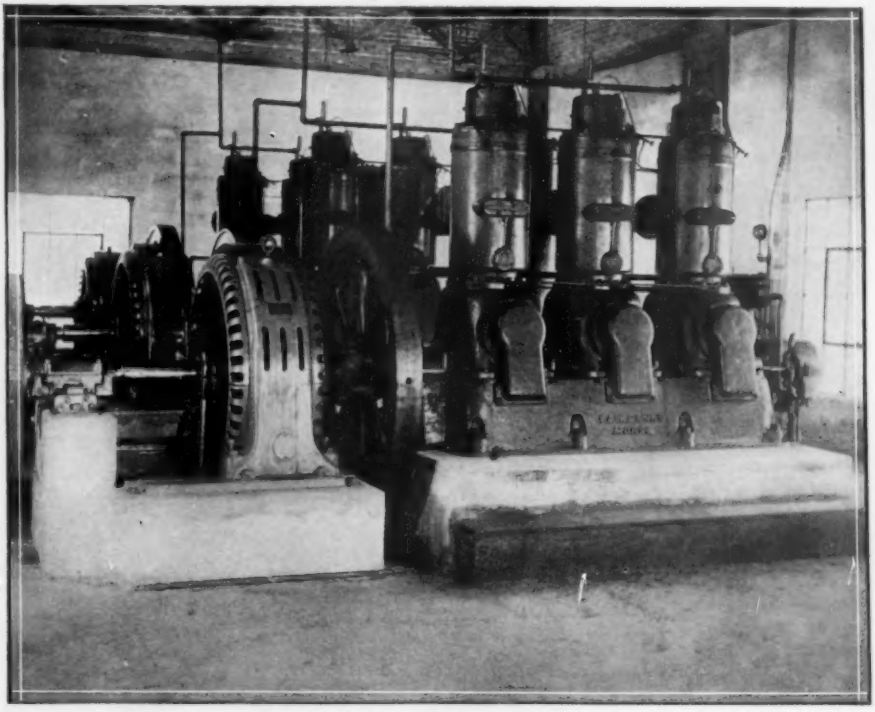
This picture shows a flow from one of NINE wells all of which are equipped with Indiana "Economy Air Lift Pumps" at LaBelle Iron Works, Steubenville, Ohio.

Possibly you have the same water supply problem that we solved for this company, or one similar to those that hundreds of other now satisfied users of Indiana "Economy" Air Lift Pumps had before our **Engineers** went on the job.

Indiana "Economy" Air Lift Pumps get the **maximum** volume of water from the well and their **freedom** from **trouble** and **breakdown** and consequent **prevention** of costly delays are giving us the volume of business which comes to only those whose product is MAKING GOOD.

Let the combination of our ENGINEERING SERVICE and MOST EFFICIENT pumping system solve your water supply problem. Send **well conditions** and **water requirements** for the "HOW."

INDIANA AIR PUMP COMPANY, Indianapolis, Ind.



City Saves $825.00 Monthly with Fairbanks-Morse "Y" Oil Engines—

And they now have all-night lights where they used to shut down at midnight. With the old equipment the cost of producing current was $.1016 per K. W. hour while with the new "Y" Oil Engines the cost has been reduced to $.0295 per K. W. hour. This plant consists of a 100 H. P. "Y" Engine direct connected to a 75 K. V. A., Alternator with exciter, and two 150 H.P. "Y" Engines direct connected to 125 K. V. A., Alternators with exciters. The pumping equipment consists of 2—75 H.P. motors driving 4"—3 stage split case centrifugal pumps. All equipment manufactured by Fairbanks-Morse—no divided responsibility. "Y" Engines produce economical, dependable power for countless different fields. Their simplicity and ruggedness assure continuous service with little attention.

FAIRBANKS-MORSE QUALITY F M 100%

Fairbanks, Morse & Co.

MANUFACTURERS CHICAGO

THE CANADIAN FAIRBANKS-MORSE CO., LTD., MONTREAL

Engines - Pumps - Motors - Hoists - Air Compressors - Fairbanks Scales - Sheffield Motor Cars - Standpipes - Coaling Stations - Etc.

NORDBERG UNIFLOW POPPET VALVE ENGINES

Speed Adjustment Easily Obtained

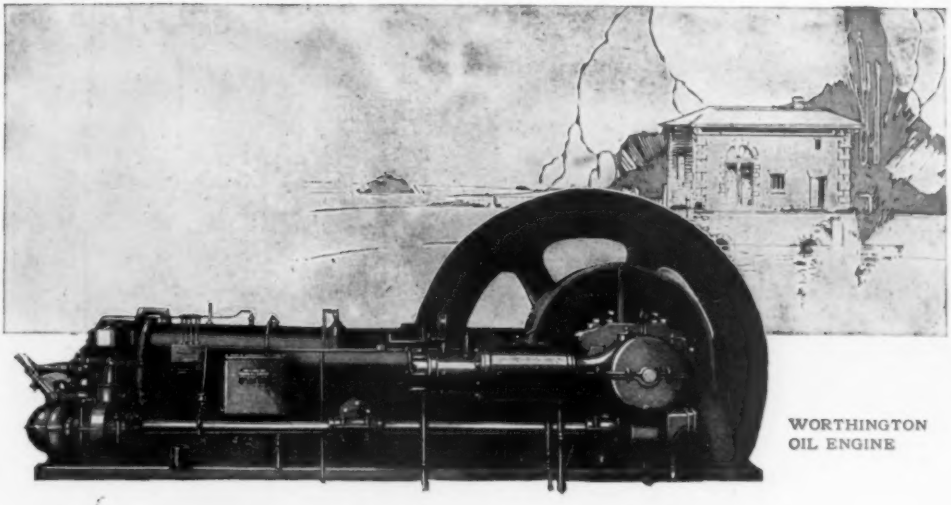
For generator drive Nordberg-Todd Uniflow Poppet Valve Engines are arranged for a speed adjustment of 5% above and below normal, to facilitate synchronizing. For variable speed drives, such as gas boosters, pumps, ammonia compressors, etc., the speed may be varied at will between full speed and half speed. In both cases the speed is changed by merely turning the handwheel shown near the cylinder head. The method used permits uniform adjustment by small increments. Very close to full speed efficiency is maintained throughout the range of speed.

Nordberg-Todd "Uniflow" Poppet Valve Engines possess a number of other distinctive operating characteristics worthy of your consideration.

For full particulars write

Nordberg Manufacturing Company

Milwaukee, Wis.



WORTHINGTON
OIL ENGINE

Worthington Crosshead Oil Engine

THE WORTHINGTON Horizontal Crosshead Oil Engine is built with one, two or three cylinders, is of the high compression or Diesel type, and is a product of the Worthington-Snow Buffalo works.

The feature which makes this Worthington Oil Engine stand head and shoulders above all competing apparatus is the crosshead. This construction permits of generously-sized wrist pin to attain maximum strength, and renders it easily accessible for adjustment and oiling. And even more important, the piston is relieved of stresses and strains for which it is not suited or purposed.

To sum up, Worthington Crosshead Oil Engine, in addition to delivering a saving, powerful, steady power service, is proof against the usual troubles which pursue and overtake the trunk piston type of oil engine.

Other Worthington Products
Steam, Centrifugal,
Power and Water Works Pumps,
Air Compressors, Meters,
Condensing Machinery,
Oil Engines and Vacuum Pumps,
Underwriter Fire Pump

WORTHINGTON PUMP AND MACHINERY CORPORATION
Executive Offices: 115 Broadway, New York City
Branch Offices in 24 Large Cities

PUMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

Dunne Works, *Holyoke, Mass.* Epping-Carpenter, *Pittsburgh, Pa.* Laidlaw Works, *Cincinnati, Ohio.* Gas Engine Works, *Cudahy, Wis.*
Blake & Knowles Works, *East Cambridge, Mass.* Worthington Works, *Harrison, N. J.* Power & Mining Works, *Cudahy, Wis.* Snow-Holly Works, *Buffalo, N. Y.*

Eighty & Eight

A quiet and well-behaved gentleman of eighty started out one fine spring morning with a grandson of eight to go to the village post office. While the grandfather went through the gateway, the youngster vaulted over the fence, vaulted back again to try a somersault on the lawn, stopped a romp with his dog to race with a passing automobile, and then cavorted back to his grandfather's side, quite out of breath.

"What's the use of all that, Johnny?" says his grandfather. "Why can't you walk along quietly, as you see me do?"

"Oh, just fun," replies Johnny, and is off again.

What is the use? Nothing. It is a natural expression of the boy's animal spirits. Eight has them, eighty hasn't. That is the difference.

A great deal of life is like that. PLAY is simply the outward expression of an inward experience. The greater part of life's activity is self-expression and that self-expression is valuable chiefly because it is also self-expansion. Eight developes his body by spontaneous athletics. Eighty develops his power to reflect by reflection.

THE EVERWEAR MFG. COMPANY
SPRINGFIELD .·. OHIO

EVERWEAR
STANDS WEAR AND TEAR

Healthy & Happy

Do you remember years ago when you were a kid and used to "see-saw" in the back lot? Wasn't it great sport? Well, the children of today are the same. They like to be out in the open air and have lots of fun. But those empty lots are all built up now and the space the children can play in is in the street.

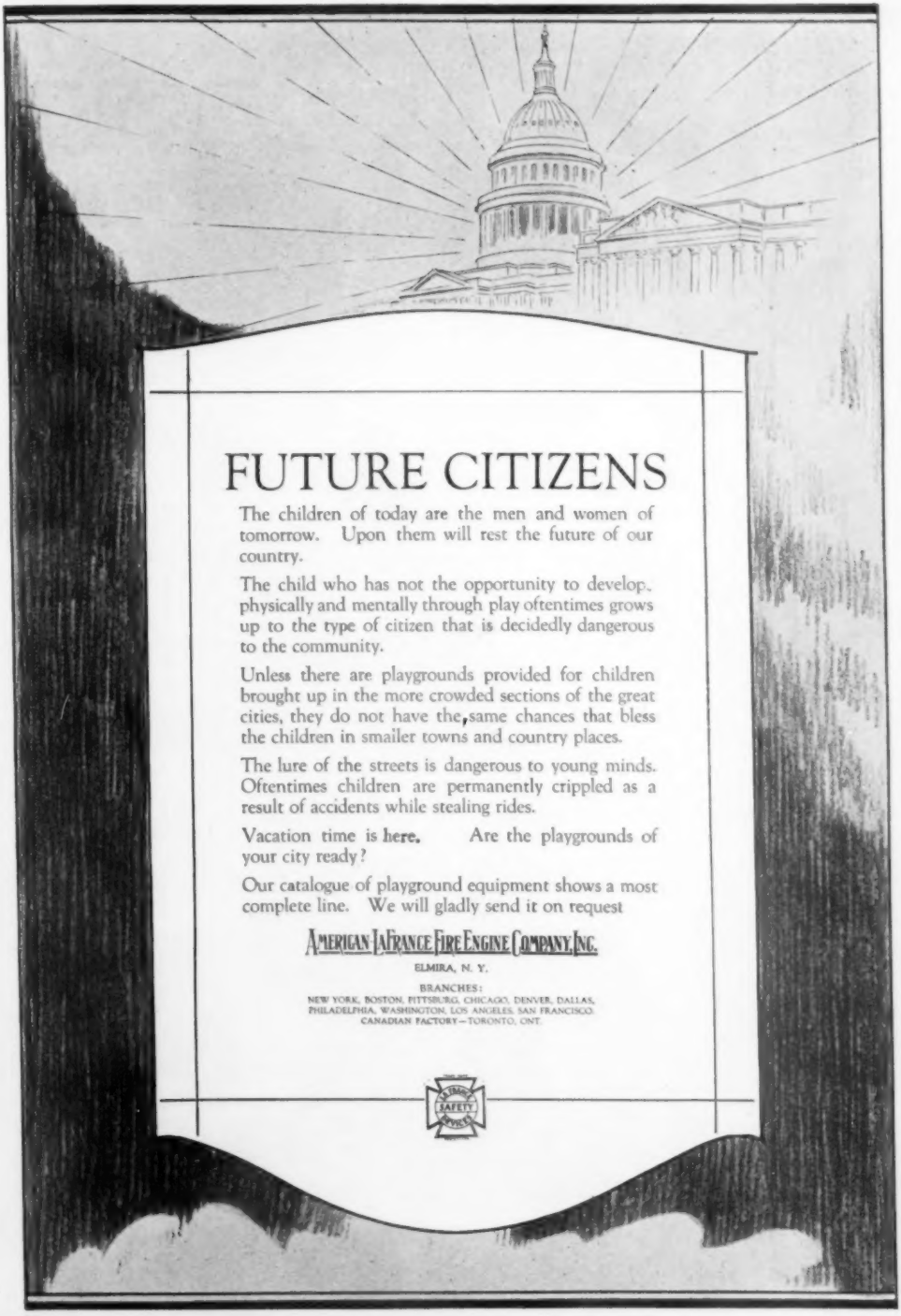
To play on the street is dangerous with all those fast running vehicles moving to and fro, and therefore cities with modern ideas have built and equipped public playgrounds. The kids in these municipalities are fortunate to have a safe place in which to play under proper supervision.

You can easily do as much for the children of your community. Provide adequate playground facilities and make the youngsters healthy and happy. It's only simple justice.

If you are interested in the welfare of your community, and as a public official, you should be, send us your address for our free, big, illustrated book full of suggestions on how to plan and equip a model playground.

THE EVERWEAR MFG. COMPANY
SPRINGFIELD .·. OHIO

EVERWEAR
STANDS WEAR AND TEAR


FUTURE CITIZENS
The children of today are the men and women of tomorrow. Upon them will rest the future of our country.
The child who has not the opportunity to develop, physically and mentally through play oftentimes grows up to the type of citizen that is decidedly dangerous to the community.
Unless there are playgrounds provided for children brought up in the more crowded sections of the great cities, they do not have the same chances that bless the children in smaller towns and country places.
The lure of the streets is dangerous to young minds. Oftentimes children are permanently crippled as a result of accidents while stealing rides.
Vacation time is here. Are the playgrounds of your city ready?
Our catalogue of playground equipment shows a most complete line. We will gladly send it on request
AMERICAN LAFRANCE FIRE ENGINE COMPANY, INC.
ELMIRA, N. Y.
BRANCHES:
NEW YORK, BOSTON, PITTSBURG, CHICAGO, DENVER, DALLAS, PHILADELPHIA, WASHINGTON, LOS ANGELES, SAN FRANCISCO.
CANADIAN FACTORY—TORONTO, ONT.
SAFETY

The Oasis and the Playground

JUST as the Oasis is a source of happiness and joy to the grim-faced desert roamers, so the playground is to the average American youngster.

The playground is the place where the boys and girls can release that excess energy, where they can satisfy that childhood desire to play, jump and climb around—in safety and under proper supervision.

Physical training is as important as mental training. Playgrounds have done more to make healthier and happier children than any other one thing—and Fun-Ful Playground Apparatus has played an important role in this great work.

Send your address for illustrated book showing how you can procure the best playground for your community.

HILL-STANDARD CO.

"Everything for the Playground"

Factories:
Anderson, Ind.
Kokomo, Ind.

THE FUN FUL LINE
PLAYGROUND EQUIPMENT

Sales Office:
733-735 Conway Bldg., Chicago

What do you think the Playground means to these Youngsters?

Have you ever thought that on the playground children find their greatest opportunity to make the most of fresh air and sunshine—to allow their growing bodies to develop as nature meant them to? Have you ever thought of it as the birthplace of democracy, where all the children meet on a common plane—the field of ambition, where the will to excel finds expression in a manly and womanly way—where the weaklings become strong and the robust stronger?

As a public official, it is your duty to help the children to build well today—by this you will be remembered in the community to which you were a benefactor.

MEDART
PLAYGROUND EQUIPMENT

For fifty years the Medart Company has been manufacturing and perfecting gymnasium apparatus for vigorous men—an experience that has particularly fitted it for the leadership it has always maintained in the playground movement and in the development of playground equipment best suited to withstand the severe use and abuse of the children.

Send for Catalog "L"

Catalogue "L" fully describes Medart Playgorund, Swimming Pool, Gymnasium and Locker Room Equipment. Contains valuable suggestions for playground installations. It will be sent gladly to anyone requesting it on their letterhead.

Fred Medart Mfg. Company

Potomac and DeKalb Sts. **St. Louis, Mo.**

Do Shippers Need Good Railroad Service?

THE COLUMBIA RIVER HIGHWAY.

From the Pacific Coast at Astoria through Portland to The Dalles, a total of 216 miles, including three 8-mile Approaches from Portland of Warrenite-Bitulithic Surfacing of New Crushed Stone Base.

When we say that good railroad service is vital to the success of our business, we mean vital NOW.

What shippers require today, and what we believe they are perfectly willing to pay for is "Service."

Shippers realize this, but they must do more than realize; they must do something to help get it.

The railroads are short of tracks, cars and locomotives, and it will take time to get all that are needed. Every shipper should bestir himself and help the railroads improve their service by getting the utmost possible use out of existing facilities.

In 1916 and 1917 shippers crowded into the railroads' Car Service Bureau in Washington begging for service.

The attitude of the shippers then was "Service at any cost."

The need for service then was not a circumstance to what it will be. The railroads must plan far ahead. To do so they must have the co-operation of the public. The railroads and the public must work together.

Until the railroads have time to increase their facilities, help them get the most out of what they have: Load and unload cars promptly. Load all cars to full carrying capacity.

An increase of two tons per loaded car would be the same as adding more than 200,000 cars to the number available for public use.

This is an extremely important matter, and we are pleased to use our Service Department in co-operation.

WARREN BROTHERS COMPANY
Executive Offices: Boston, Mass.

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Protecting Young Eyes

Eye strain has been eliminated in thousands of our schools where superintendents and teachers have the true interest of their pupils at heart. How?—By the use of Oswego Tinted Cambric or Triplex Opaque shade cloth mounted on the celebrated Hartshorn Two-Way Rollers.

Write for samples of Colors 214 and 204 in Tinted Cambric, which have been analyzed by chemists and adopted by School Boards of some of the larger municipalities.

STEWART HARTSHORN CO.

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SPECIFY
APEX APPARATUS

for your playground equipment. You will get the best value in continued ***safety strength, simplicity, and satisfaction.***

Have your empty lots made into playgrounds where the kiddies can have a safe place to exercise and play away from dangerous traffic.

We will show you how. Send us your ground space now while you have it in mind. No obligation on your part.

PLAYGROUND OUTFITTER

HOWARD GEORGE, Philadelphia, Pa.

APEX.—The apparatus that won't work loose.

Bausman
Steel Swings and Settees

Thirty-five years manufacturing Steel Swings and Settees for Parks, will give you the service you desire.

We use only High Grade Carbon Steel and Hardwood in making Bausman Steel Swings and Settees. May we quote prices on your requirements? Send for our Catalogue No. 20.

BAUSMAN MFG. CO.
Bausman (Lanc. Co.) Pa.

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(TRADE MARK)

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THE DUSTOLINE FOR ROADS CO., Summit, N. J. Phone 33

Has none of the objectionable features of the black asphaltic Oil or tar preparations

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Portland Cement

Quality and Service Supreme

Pennsylvania Cement Co. 30 E. 42 St., New York City

Has Your Town Any Playgrounds?

If Not—Build Them

WELL-EQUIPPED playgrounds are not expensive, but are good investments. They save the lives and better the health of children by keeping them off the streets and by offering attractive means of exercising. These children, your coming citizens, will be happier, more honest and ambitious men and women if they learn to play right. Equip your playgrounds with

"AMERICAN APPARATUS"

which gives you the least trouble, the most service, safety, durability, simplicity and strength.
If you are planning a model playground, write us. We can show you the economic way. Our interesting catalog sent on request. Full of illustrations and suggestions.

American Playground Device Co., W. 25th St., Anderson, Ind.

Why You Should Advertise for Bids NATIONALLY—

Nation-wide publicity reaches the greatest number of responsible bidders best fitted to do work in the most up-to-the-minute manner at lowest cost.

It makes local bidders figure closer and adopt the most efficient methods of doing work.

It is evidence of good business administration—an honest effort to furnish efficient service.

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ENGINEERING NEWS-RECORD is a consolidation of the three leading publications in the engineering and construction field—Engineering News, Engineering Record and The Contractor. It has a circulation of about 34,000 copies weekly—several times that of any other paper in the field—and includes among its readers almost every worthwhile contractor, engineer, manufacturer and dealer in the country interested in bidding on work such as yours.

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Perhaps the best indication of what other cities and towns think of the results obtainable through the official proposals columns of ENGINEERING NEWS-RECORD is the fact that more than 3,000 of their announcements appear each year. Many of their letters telling of the savings realized as a result of their advertising in this great medium are further proof of the worthwhileness of national publicity through ENGINEERING NEWS-RECORD.

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Vol. XXII — CONTENTS FOR JUNE, 1920 — No. 6

ARTICLES APPEARING IN THE CITY EDITION ONLY

Increasing and Improving a New England Water-Supply 563
Another Proof that Metering Saves Money for Municipalities 567
Street Sweeping in Montreal, Canada..... 568
The New "White Way" in Maysville, Ky.... 569
Electrically Operated Pumping Plants in Indiana 571
The Volume of Laboratory Work Necessary to Control a Public Water-Supply..... 576
The Cure for Vandalism in City Parks..... 579
Methods of Preventing the Destruction of Asphaltic Pavements by Heavy Motor trucking 582
Sheet Asphalt Pavement Successfully Withstands Unusual Traffic 584
The Fields of the Air-Lift and the Deep-Well Pump 585
Savings Through Water-Waste Control..... 586
List of Municipally Owned Asphalt Plants in the United States and Canada..... 587
The All-Year School 588
Vital Statistics and the Physicians..... 592

ARTICLES APPEARING IN THE TOWN AND COUNTY EDITION ONLY

Communal Forests in America..... 563
Notes on French Highway Construction..... 567
The Water-Works of Van Buren, Ind..... 569
Highway Engineering in Towns and Small Cities 572
Machines Replace Men on Lincoln Highway Work 577
Billerica Secures Its Playground Appropriation 581
Our Unexplored Counties 582
A Notable Pennsylvania Penetration Road... 585
A New Highway System for Tarrant County. 586
The Use of Road Machinery in Brookings County 589
Modern Guide-Boards 590

ARTICLES APPEARING IN BOTH EDITIONS

Forward Steps Reported by Municipal Officials and Department Heads 593
- Life Insurance for All the Employes of a City
- Intensified Use of Recreation Grounds and Buildings
- Dental Clinics in Schools
- A City that Has Come Back to the Farm
- Not Like the Ordinary Rest Room
- A Lunch Wagon for Policemen
- A Library for Hospitals

Prevailing Methods of Garbage Collection and Disposal in American Cities—Part II..... 602
Personality and Human Beings in Town-Planning Work 609
Protection of Water-Supplies by Sewage Purification 610
The Elimination of Electrolysis of Water-Mains 613
Where Public Schools and Playgrounds Have Joined Forces to Utilize the Play Instinct.. 616
Water Waste and How to Prevent It..... 619
Municipal and County Motor Trucks that Furnish Valuable Service 620
A New Field for the Development of Fire Prevention 622
News and Ideas for Commercial and Civic Organizations 625
- A Road and Travel Bureau
- Successful County Hospital Campaign
- How the Trenton Chamber of Commerce Builds Retail Trade
- $5,000,000 Hotel Financed by Providence Chamber of Commerce
- New Membership-Getting Plan Stimulates Civic Spirit

"Colonized" Luncheon and Forum Meetings.
- Million-Dollar Civic Fund Raised by Middletown Chamber
- Lake Michigan Made Accessible to Manisteeans

The City's Legal Rights and Duties..... 639
- Regulating Use of Streets
- Establishing Alley Grades
- Supply of Impure Waters to Consumers
- Powers of Pennsylvania Cities
- Pennsylvania Vehicle Licenses
- Alternative Specifications for Street Work
- Municipal Taxation of Corporations

On the Calendar of Conventions..... 643
Municipal and Civic Publications..... 645
Methods, Materials and Appliances 649

Roll Call

of White Truck Fleets in Municipal Service

THE following is a list of cities, counties and states who own ten or more White Trucks, showing the yearly progress in added trucks per owner. No more impressive evidence could be given of White durability, dependability and economy in municipal service.

	1910	1911	1912	1913	1914	1915	1916	1917	1918	To-day
City of Akron	0	0	0	1	1	1	4	5	8	11
City of Atlanta	0	3	6	8	10	10	11	11	15	15
City of Baltimore	0	3	4	7	14	14	29	30	31	34
City of Boston	0	2	9	12	17	18	18	19	22	22
City of Chicago	0	0	0	1	4	10	27	38	47	47
City of Cleveland	0	2	7	14	15	19	23	32	36	43
City of Indianapolis	0	0	0	1	1	2	2	2	6	12
City of Manila	0	0	3	3	3	7	8	11	11	12
City of Newark	1	2	2	3	3	3	3	4	7	11
City of New York	0	1	7	11	12	13	13	13	13	13
City of Pittsburgh	0	2	9	14	14	15	15	15	15	15
City of St. Louis	0	0	0	0	4	6	9	10	14	16
City of San Francisco	0	0	0	1	1	1	1	3	10	14
Hawaii County, T. H.	0	0	2	9	9	9	10	11	16	17
Onondaga County, N. Y.	0	0	0	0	1	3	5	10	16	16
Province of New Brunswick	0	0	0	0	0	0	20	20	20	19
Province of Nova Scotia	0	0	0	0	0	0	0	0	10	11
State of Massachusetts	0	1	4	4	4	5	11	11	11	11
State of New Jersey	0	0	0	1	1	1	1	6	16	15
State of New York	0	0	3	3	3	5	29	37	37	38
State of Pennsylvania	0	0	0	0	1	2	5	15	15	16

There are now in actual service 3,691 White Fleets, comprising 40,919 trucks, exclusive of single truck installations.

THE WHITE COMPANY
CLEVELAND

Make Streets Clean

"Studebaker Model"

FLUSHING and SPRINKLING UNITS

Forty feet from curb to curb—sand filled brick pavement—cleaned in one trip with three nozzles.

The machine has four nozzles which can be used discharging one, two or three flushing streams at the same time.

Removing the heavy accumulation of Winter or the lighter dirt of Summer is within the range of this machine due to the adjustable nozzles and the independent control of the pressure.

A horse-drawn uniform pressure flusher is provided where conditions do not justify investment in a motor flusher but where economical, efficient and sanitary cleaning is desired.

Inquire of any motor truck manufacturer or ask the truck dealer in your city for complete information on **"STUDEBAKER MODEL"** flushing and sprinkling units mounted on their trucks, or address

Municipal Supply Company

South Bend, Indiana

THE SECO PORTABLE PUMPING APPARATUS

CLEANING sewer catch basins for the City of Detroit,

At a marked reduction in cost and accomplishing the work 3 to 4 times faster than any other method,

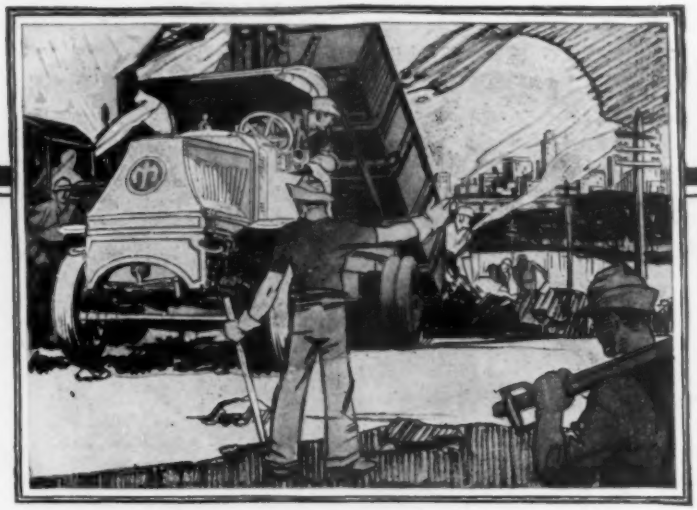
In a clean and sanitary manner, safeguarding the health of the City.

Mounted on Special Kelly-Springfield Chassis.

Let us tell you more about it.

Write for full information and catalogue

THE SPRINGFIELD ENGINEERING COMPANY
SPRINGFIELD, OHIO



Approved!

"On the Knoxville, Tenn., job, our Bull Dog Mack produced a net saving of approximately $60 per day over our former expense with teams."

The following representative municipal Mack fleets now in use are significant evidences of approval.

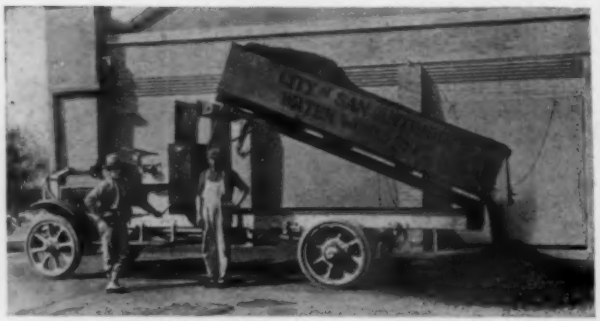
City of New York, Municipal	150
City of Chicago, Municipal	43
City of Philadelphia, Municipal	54
City of Baltimore, Fire	42

Mack engineering features combined with eighteen basic Mack patents have developed the motor truck the world is talking about.

INTERNATIONAL MOTOR COMPANY
NEW YORK

"PERFORMANCE COUNTS"

Mack TRUCKS



Federal truck equipped with hoist and dump body operated by the Water Works Department, San Antonio, Texas.

A Federal—For Dependable Hauling

When you choose a Federal for your city, township or county, you can feel certain of three things:

First, that your judgment of the *rightness* of the truck is correct. Ten years of successful truck building experience has contributed the assurance that the design and workmanship of this truck is right.

Second, you are certain that you have chosen a truck that will stay right. Federal trucks have been in continuous successful use by cities and towns for periods of well over ten years.

Third, that the dependability which you have purchased in a Federal truck is not expensive. Federal records of economy are second to none, anywhere. The Federal you purchase will give complete satisfaction in its low upkeep and operation costs.

There is a Federal capacity to fit the need you have of a truck. The Federal dealer in your city will appreciate the opportunity of demonstrating it to you.

"Traffic News"—An interesting magazine of transportation sent free on request.

This is the sign of the Tenth Year Federal, a sign significant of ten years of success in every field of truck transportation.

FEDERAL MOTOR TRUCK COMPANY
34 FEDERAL STREET DETROIT, MICH.

Another FEDERAL

Packard Truck in street cleaning service. How long will the gears of the average assembled truck stand up under the constant stopping and starting required of a Street Department Truck

Why Packard Discarded "Ton Rating" for Packard Trucks

REASONING as *transportation engineers*, the Packard Company has believed for years that the arbitrary factory "ton rating" system was bound to become obsolete as soon as sufficient facts on transportation could be known.

These facts are now at hand—made available through more than 7000 Monthly National Standard Truck Cost System Reports covering a period of two years.

These reports confirm what Packard has so long foreseen—the fallacy of rating a truck simply on the tonnage capacity of the chassis and engine under normal conditions.

They have proved again and again the sound Packard practice of rating a truck with *all* the transportation factors in mind—character of roads, grades to be met, speeds to be maintained, and the chances of overload, etc.

Compare a Packard Size G, Model E, Truck, developing nearly 6700 pounds traction at rear wheels and able to pull a 28 per cent grade on low gear; with the typical "6-ton Truck" of competing make, developing less than 4700 pounds traction, and able to pull only a 20 per cent grade.

The Packard frame, both strong and flexible—made of rolled channel steel, not pressed steel. Packard *solid tired* trucks governed at 11, 13, 15, 18 miles per hour, by the Packard transportation expert in touch with the actual job. Today, as always, Packard is selling *transportation.*

Hereafter each Packard Truck will be designated by *size* and *model.*

The rating will be made on the ground, *for the job,* by the local Packard engineer—selected for what it will do in the individual customer's needs, and with all his *actual conditions* in mind.

"Ask the Man Who Owns One"

PACKARD MOTOR CAR COMPANY, *Detroit*

TIFFIN STREET FLUSHERS

Go to the

USER for FACTS

The City of Flint, Michigan, wouldn't have bought their second Tiffin Street Flusher, if the first machine, which had been in use long enough to demonstrate its working capacity, hadn't made good.

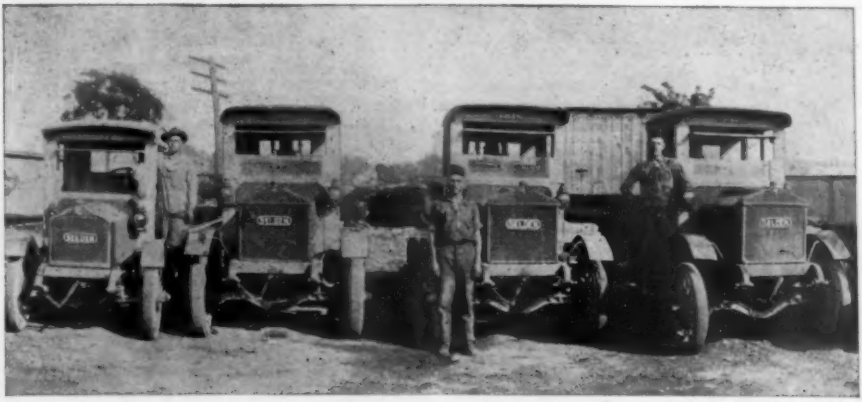
Lorain, Ohio, wouldn't have bought, nor Portland, Oregon; Pueblo, Colorado; Peoria, Illinois, or London, Canada, if the officials of those cities hadn't been satisfied with the tests they saw and the testimony of other cities using Tiffin Street Flushers.

We claim that these machines will do more work, and better work—and do it at less average expense—than any other. It is a claim that we prefer to have you confirm by getting the opinion of actual users.

Shall we put you in touch with this evidence?

THE TIFFIN WAGON COMPANY
TIFFIN, OHIO

Makers, also, of Tiffin Motor Trucks, Municipal Vehicles, Farm and Dump Wagons, etc.



Selden Trucks Make a Record on Toledo-Buffalo Road

WITH the aid of ten SELDEN Trucks, twelve miles of monolithic brick paving were laid on the Toledo-Buffalo road, between Ashtabula and Conneaut, Ohio, in the record time of ninety-two days. And this road is pronounced by State and National Highway officials to be one of the finest in America.

Nearly two thousand carloads of materials, including six million paving bricks, were used in the construction of this half a million dollar road—the majority of which was hauled by ten SELDEN Trucks. The average haul was 2½ miles and an average of 100,000 bricks was hauled daily.

"Working alongside of four other leading makes of trucks, my SELDEN Trucks gave far better satisfaction," says Thomas P. Fitzgerald, the contractor.

Similar reports of highly efficient performances of Selden Trucks are given by contractors and municipal officials in all parts of the country.

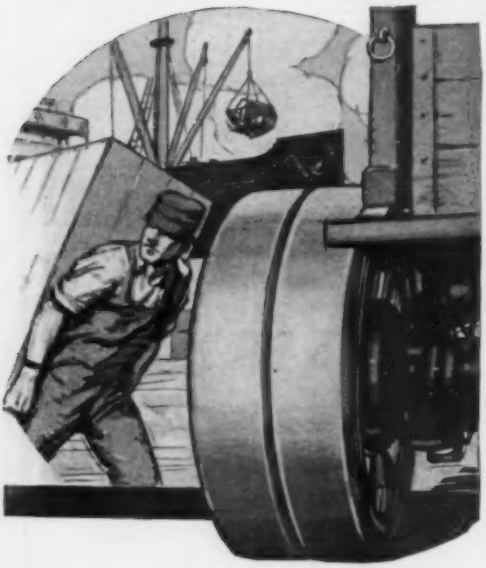
The Magazine "TRUCK TRANSPORTATION" will be mailed free to all interested upon receipt of request to Dept. AC
SELDEN TRUCK CORPORATION
Rochester, N. Y.

Ship by Truck —SELDEN Truck

1½, 2½, 3½, 5 Ton Models—All WORM Drive

Selden Trucks

SELDEN TRUCK CORPORATION, Rochester, N. Y., U. S. A.



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—when your busy trucks are working out that hauling contract.

UNITED STATES SOLID TRUCK TIRES have set a high mark for mileage and dependability.

As standard equipment, UNITED STATES SOLID TRUCK TIRES are making good everywhere under capacity loads.

United States Tires are Good Tires

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US
RUBBER SYSTEM
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O Bi-Lateral Fire Hose construction keeps the rubber from cracking or leaking. If you want the best fire hose at the lowest cost per year of service, send for our catalogue.

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Write for long service records in your line and Booklet No. 107 B.

Made in JERSEY CITY, N. J., by the
JOSEPH DIXON CRUCIBLE COMPANY
JERSEY CITY NEW JERSEY
Established 1827

100% Protection

Are you getting 100% protection from your Fire Department?

Of course every man in the Department is giving all he has to the job, but how about the apparatus? Is it efficient, up-to-date?

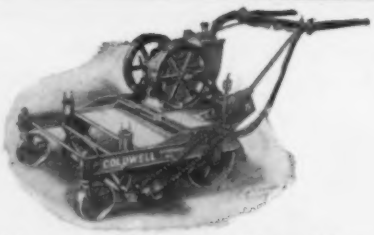
In the Fire Departments of the leading American towns they have proved the advantage of equipping the apparatus with Firestone Tires throughout.

Most Miles *per* Dollar

A sure start, a firm road-grip, speedier runs and a safe arrival. These are the points that count for 100% protection and give Firestone Tires first place with the fire fighters.

FIRESTONE TIRE & RUBBER CO.
FIRESTONE PARK AKRON, OHIO
Branches and Dealers Everywhere

Firestone



Does the Work of Four Men

Coldwell's Motor Lawn Mower and Roller (walk type) pays for itself many times in the wages it saves. Does 4 men's work. Geared to 4 miles an hour—easily operated. Long wear. Coldwell's Combination Motor Lawn Mower and Roller Model J—the latest ride type machine. Weighs 1,100 pounds on the drive rollers, 40-inch cut. Useful on parks, estates and country clubs. Write for complete catalog of the Coldwell line, including Gang Mowers, Horse and Hand Lawn Mowers.

Coldwell Lawn Mower Company

Largest Makers of High-Grade Lawn Mowers in the World

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GUARANTEED 2½ YEARS

Made exclusively for Fire Department use.

Ride like Pneumatics
No Punctures
No Blowouts

Write for information

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Dayton, Ohio

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is of an unusually careful manufacture
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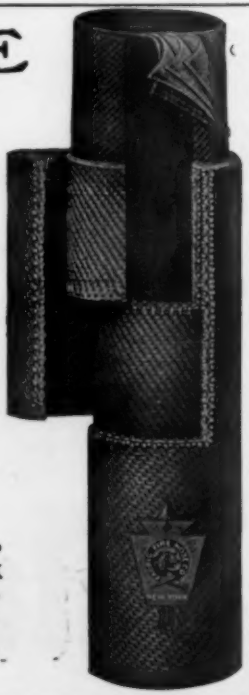
The lining is of fine Para Gum, hand made, four calendered, smooth bore or lap-jointed

Circular balance woven, each strand of cotton is treated to a bath of melted Wax and Para Gum, then cabled and woven into the jackets.

Absolutely waterproof, making the ideal hose for fire departments.

Treatment lubricates and solidifies the strands of cotton, assuring long wear.

Made in all sizes from 1 to 6 inches inside diameter.



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CHICAGO, ATLANTA, COLUMBUS, O., MINNEAPOLIS, OKLAHOMA CITY, PORTLAND, ORE., SAN FRANCISCO, BALTIMORE, MD., ELMIRA, N. Y., BINGHAMTON, N. Y., PITTSBURGH, NEWARK, N. J., MONTREAL, PROVIDENCE, DALLAS, TEX.

Patentee and Sole Manufacturer

Kelly Caterpillars enabled 5-ton truck to haul 16-ton load over mountains

"It was extraordinary," writes Mr. C. H. Hemme of San Diego, owner of the truck, "to see the rubber of the Kelly-Springfield Caterpillar tire spread itself from underneath the weight of the load and assume its normal shape again when released. We firmly believe that only the Caterpillar tire, allowing the rubber to spread in several directions, saved the day, as no other tire would have stood the extreme overload without coming loose from the steel. For heavy-duty service there is no tire that gives me more satisfaction than the Kelly-Springfield Caterpillar tire."

We don't recommend overloading a truck. It is bad for the truck and bad for the tires. But there are times when overloading is necessary, and when that time comes it is a great satisfaction to know that your tires can haul any load the truck can bear.

Kelly-Springfield Tire Co.

New York, N. Y.

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A Program of Twelve Lectures by

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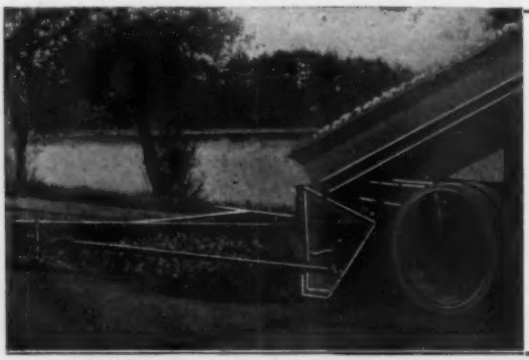

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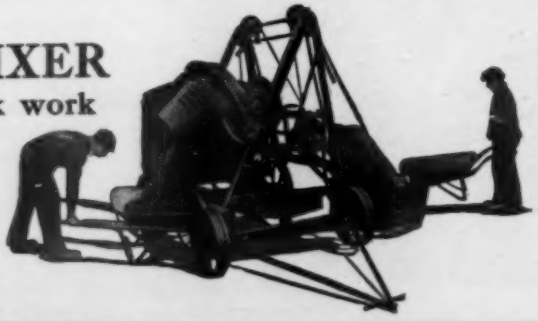

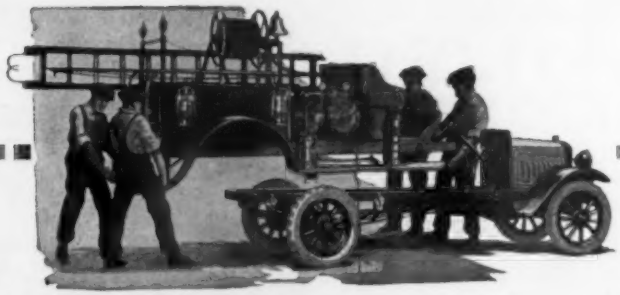

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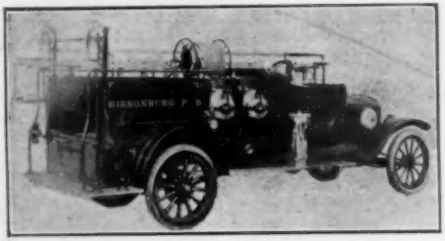

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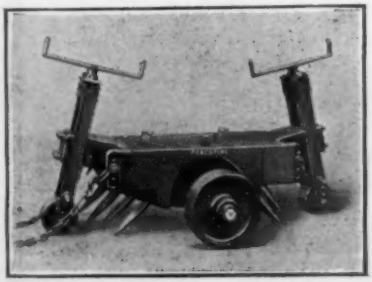

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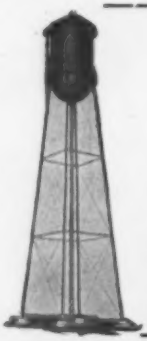

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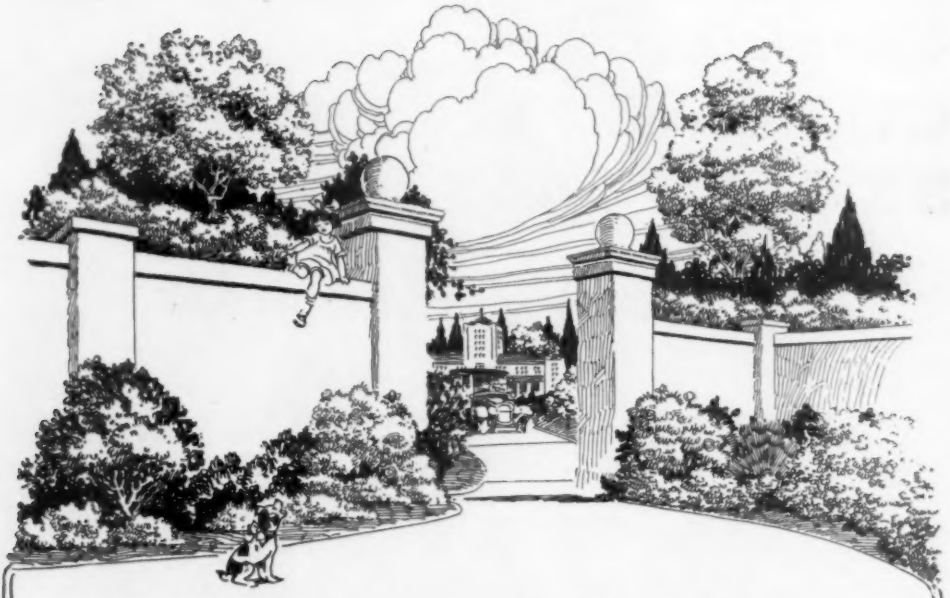

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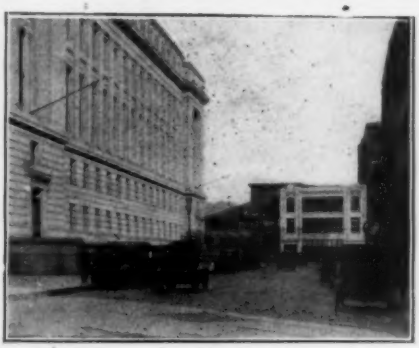

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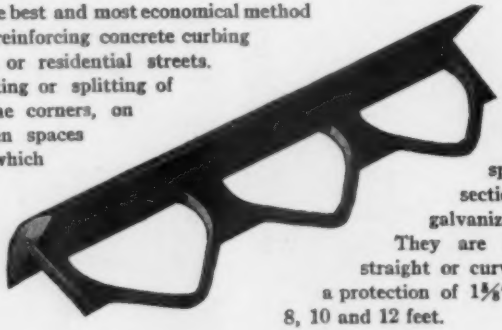

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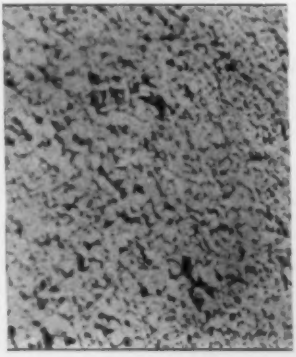

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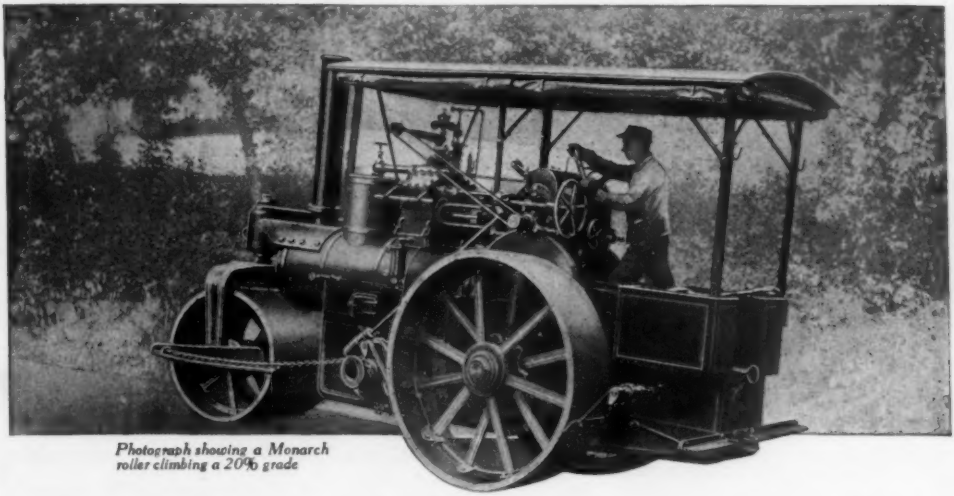

Photograph showing a Monarch roller climbing a 20% grade

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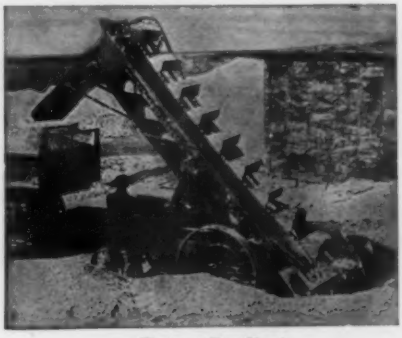

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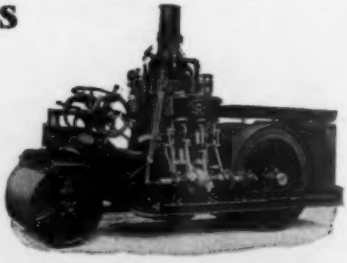

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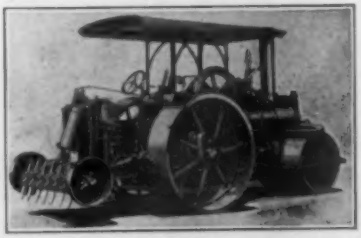

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Heat and volume under instant control of operator. Positive pressure produced by, the Kinney Pump.

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HANDY HEATER and SPRAYER

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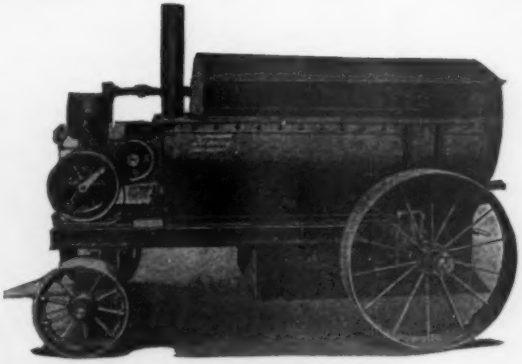
No burning or coking of material. Pump, Piping, Hose, Nozzles, Automatically Heated.

No Steam Required.



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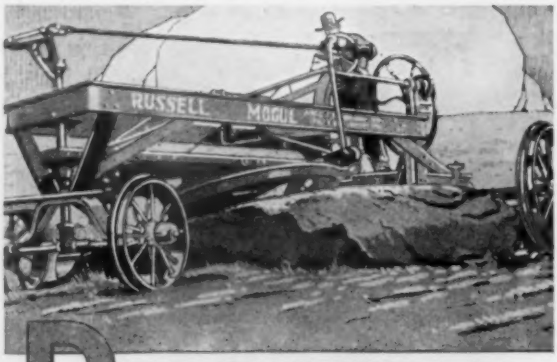

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Eight mail boxes to save a few steps and only one box to save the seconds that save the lives. A booklet "A Box a Block" covers this subject in interesting fashion. Send for your copy.

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Type R O Constant Current Transformer

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THE ONLY CENTER-JET NOZZLE

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guards the municipal park against the combined attack of hot dry summer weather and the feet of playing children.

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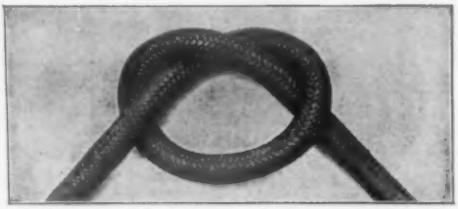

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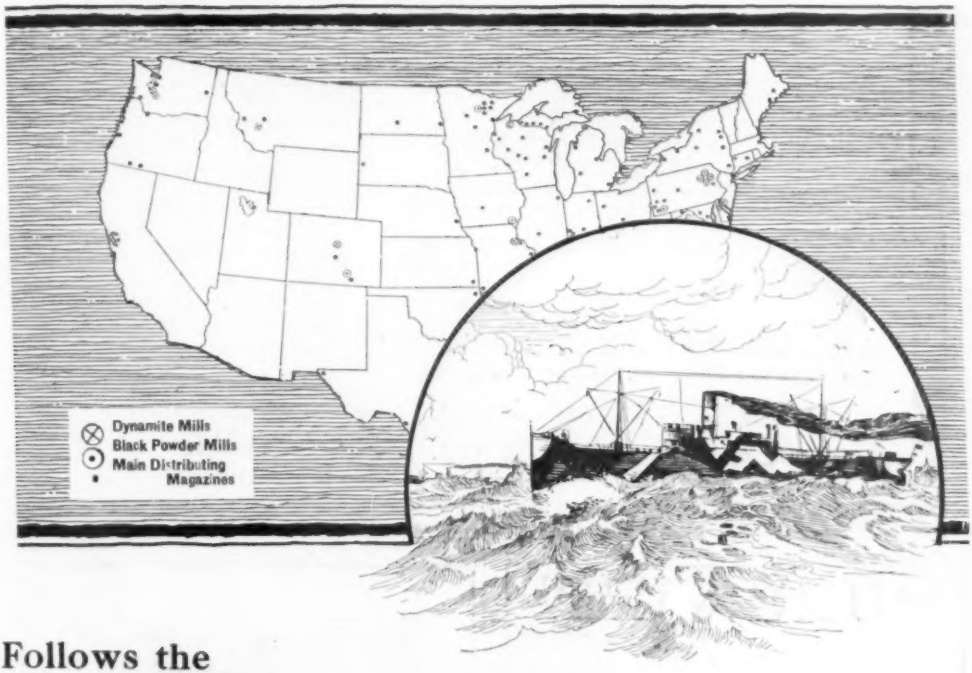

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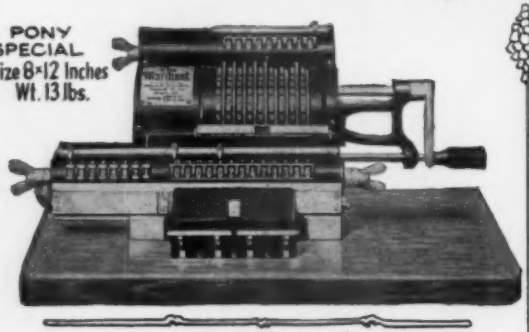

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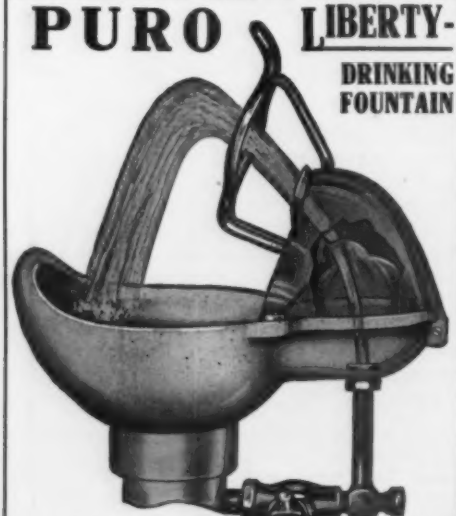

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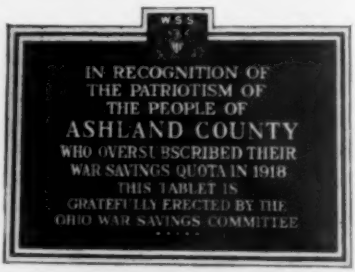

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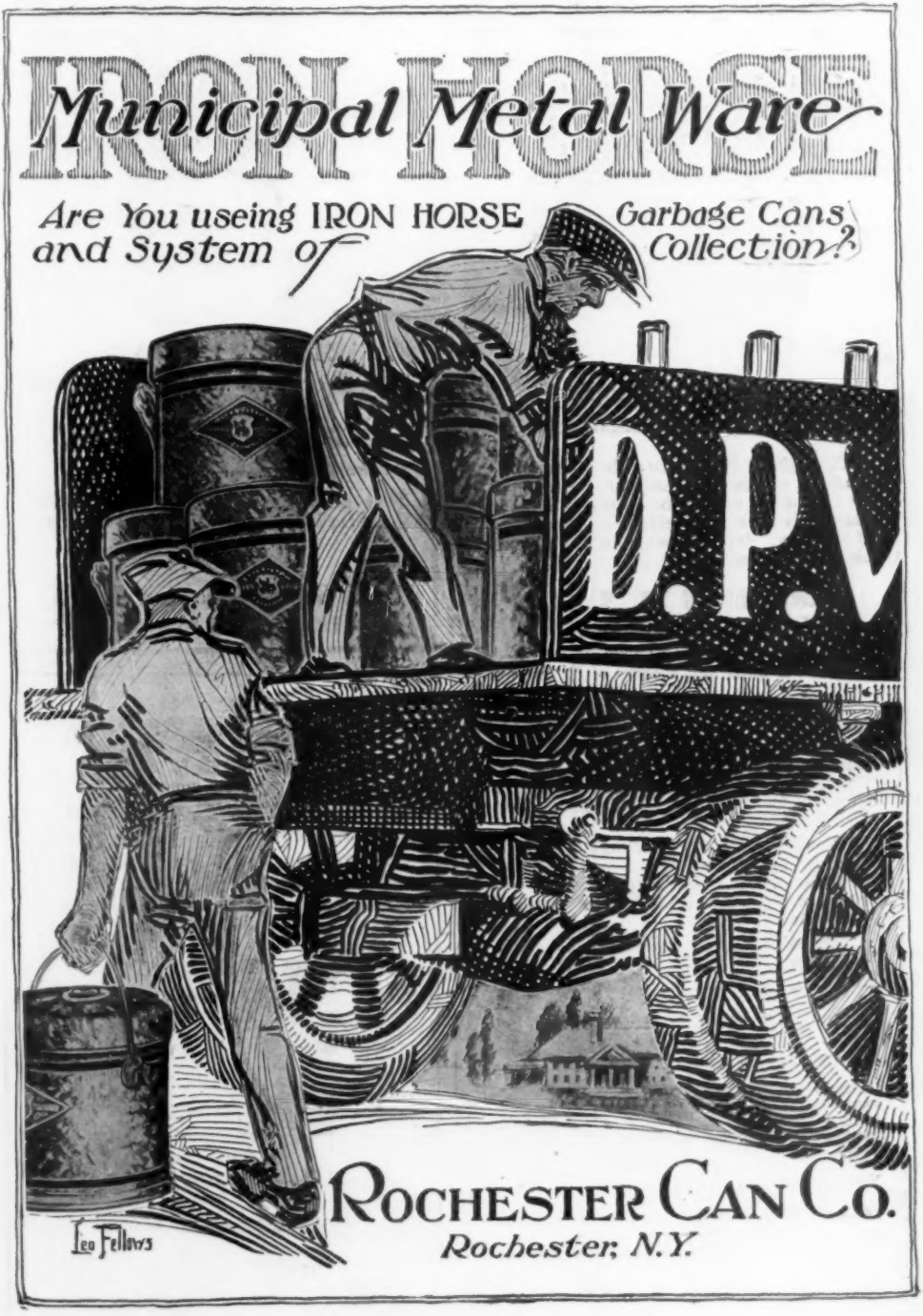
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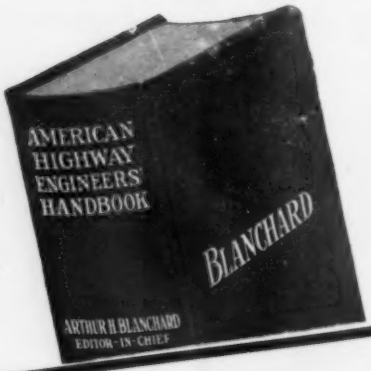

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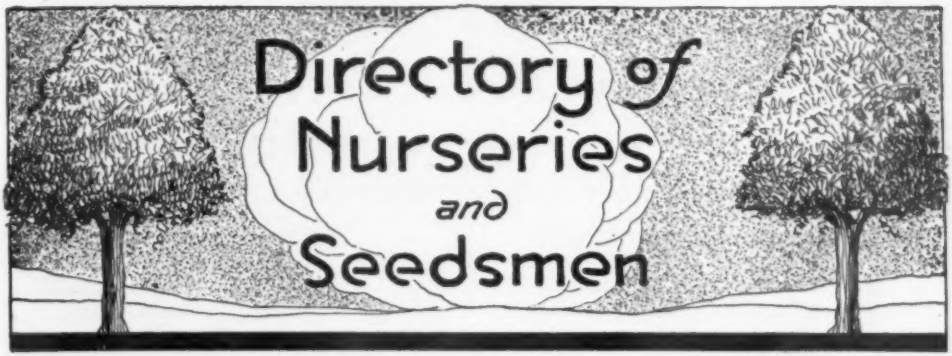

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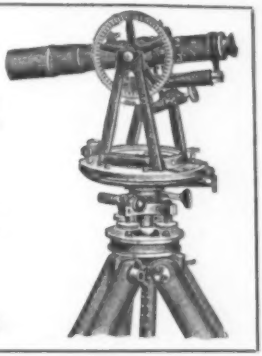

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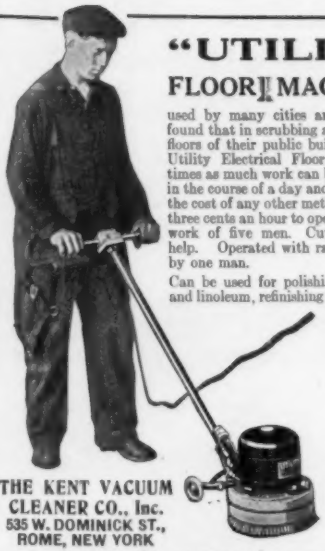

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Every name in this list is represented by an advertisement in this issue of THE AMERICAN CITY. The alphabetical index to all advertisements follows this classified list. See page 146

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Continued on page 138

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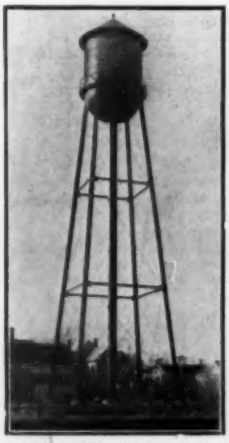
Elevated steel water tanks on concrete foundations are standard for increasing the pressure or storage in cities throughout this country.



Greensboro, Md. Capacity 100,000 Gallons. Height 146 ft. 8 in. to top.

Pittsburgh Des Moines Standard Elevated Steel Tanks

Crewe, Va. Capacity 200,000 Gal. Height 155 ft. 5 in. to top

have been found the most economical wherever installed. Particular attention is paid to all details and bracing to produce a tank which will withstand the inroads and attacks of weather. The standard tank has a full hemispherical bottom formed of steel plates made to the exact curvature.

A copy of municipal catalog No. 17, giving specifications for different kinds of tanks will be sent on request

Pittsburgh-Des Moines Steel Co.

SALES OFFICES

Pittsburgh	1007 Curry Bldg.
New York	64 Church St.
Dallas, Texas	1222 Praetorian Bldg.
Chicago	1272 1st National Bank Bldg.
San Francisco	318 Rialto Bldg.
Washington, D. C.	950 Munsey Bldg.

940 Tuttle Street, Des Moines, Ia.

SHOPS

Pittsburgh, Pa. Des Moines, Ia.

Canadian Des Moines Steel Co., Chatham, Ont.

Every name in this list is represented by an advertisement in this issue of THE AMERICAN CITY. The alphabetical index to all advertisements follows this classified list. See page 146

Dump Carts and Wagons.
Austin-Western Road Machy. Co.
Good Roads Machinery Co.
Tiffin Wagon Co.

Dust Laying Compounds.
Barrett Co.
Dustoline for Roads Co.
Semet-Solvay Co.
Standard Oil Co. of Indiana
Texas Company.

Electric Current Meters.
General Electric Co.

Electric Generators and Motors.
Allis-Chalmers Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Electric Lamps.
Cutter Works, George.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Electric Lighting Plants.
Fairbanks, Morse & Co.

Electrical Supplies.
Bissell Co., F.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Electric Transformers.
Kuhlman Electric Co.

Enameled Iron Signs.
N. Y. Enamel Steel Sign Co
Niagara Falls Metal Stamp Wks.

Engineers' and Surveyors' Instruments.
Kolesch & Co.
Weber & Co., F.

Engineers, Consulting.
See Page 121.

Engines
Allis-Chalmers Mfg. Co.
Busch-Sulzer Bros.-Diesel Eng. Co.
Indiana Air Pump Co.
Norberg Manufacturing Co.

Engine, Gas. (See Gas Engines.)

Exhibition Material
Educational Exhibition Co.

Expansion Joint Material.
Barber Asphalt Paving Co.
Barrett Co., The
Carey Co., Philip
Pioneer Asphalt Co.
Texas Company
Truscon Steel Co.

Feed Water Heaters.
Pratt & Cady Co., Inc.

Fencing.
Barnum Iron Works, E. T.
Stewart Iron Works Co.

Fertilizers.
Dreer, Henry A.

Filters-Feed Water.
Pittsburgh Filter & Engineering Co.

Filtration Plants.
N. Y. Continental-Jewell Filtra. Co.
Norwood Engineering Co.
Pittsburgh Filter & Engineering Co.

Fire Alarm Cables.
Bissell Co., F.
Hazard Mfg. Co.
Simplex Wire & Cable Co.

Fire Alarm Systems.
Gamewell Fire Alarm Telegraph Co

Fire Department Apparatus.
See Automobile Fire Apparatus.

Fire Department Supplies.
American La France Fire Engine Co.
Childs Co. O. J.
Grether Fire Equipment Co.

Fire Extinguishers,"Automatic.
Grinnell Co.
Northern Fire Apparatus Co.

Fire Extinguishers, Chemical.
American-LaFrance Fire Engine Co.
Childs Co., O. J.
Grether Fire Equipment Co.
Grinnell Co.
Northern Fire Apparatus Co.

Fire Hose.
Bi-Lateral Fire Hose Co.
Fabric Fire Hose Co.
United States Rubber Co.

Fire Pumps.
Fairbanks, Morse & Co.
Northern Fire Apparatus Co.
Worthington Pump & Machy. Corp.

Flag Poles.
Barnum Iron Works, E. T.

Flexible Joints.
U. S. Cast Iron Pipe & Fdry. Co.

Floor Machines for Scrubbing, Polishing and Sanding.
Kent Vacuum Cleaner Co.

Forms for Drainage & Sewerage Tile
Northwestern Steel & Iron Works.

Fountains.
(See Sanitary Drinking Fountains.)

Furnaces, Melting.
Leadite Co.
Mueller Mfg. Co., H.

Garbage Cans—See Cans

Garbage Incinerators.
Destructor Co., The

Garbage Wagons.
Austin-Western Road Machy. Co.
Autocar Co., The
Federal Motor Truck Co.
International Motor Co.
Packard Motor Car Co.
Service Motor Truck Co.
White Co., The.

Gas, Chlorine.
Hooker Electrochemical Co.
Electro Bleaching Gas Co.

Gas Engines.
Allis-Chalmers Mfg. Co.
Fairbanks, Morse & Co.
National Meter Co.
Pittsburgh Filter and Engineering Co
Worthington Pump & Mach. Corp

Gaskets.
Leadite Co.

Gas Meters.
Builders Iron Foundry
General Electric Co.
Pittsburgh Meter Co.

Gasoline Pumping Engines.
Fairbanks, Morse & Co.
Northern Fire Apparatus Co.
Worthington Pump & Mach. Corp.
Waldo Bros. & Bond Co.

Gasoline Storage Tanks.
Bowser & Co., Inc., S. F.
United Iron Works, Inc.

Gates For Parks and Cemeteries.
Barnum Iron Works, E. T.
Stewart Iron Works Co.

Gauges, Loss of Head, Rate of Flow.
Builders Iron Foundry
N. Y. Cont. Jewel Filtration Co.
Simplex Valve & Meter Co.

Gauges—Surface, Reservoir and Special Water Works.
Builders Iron Foundry
Clark Co., H. W.
Simplex Valve & Meter Co.

Graders.
Austin-Western Road Machy. Co.
Baker Mfg. Co.
Lyle Culvert & Road Equip. Co.
Russell Grader Mfg. Co.
Union Iron Products Co.
Zieg Mfg. Co., F. B.

Graphite.
Dixon Crucible Co., Joseph.

Grass Seed.
Burpee Co., W. Atlee.
Dreer, Henry A.

Health and Amusement Devices.
American Playground Device Co.
Everwear Mfg. Co.
George, Howard.
Hill-Standard Co.
Medart Mfg. Co., Fred

Heating Kettles.
Connery & Co., Inc.
Good Roads Machinery Co.
Littleford Bros.
Tarrant Mfg. Co.

High Pressure Hydrants.
Clow & Sons, James B.
Smith Mfg. Co., A. P.

Hoists. (Builders).
Allis-Chalmers Mfg. Co.
Fairbanks, Morse & Co.
Nordberg Manufacturing Co.

Hoists for Dump Trucks.
Columbian Steel Tank Co.

Hollow Tile.
Hollow Building Tile Assn.

Hose.—See Fire Hose.

Hot Mixers.
Barber Asphalt Paving Co.

Hot Water Service Heaters.
Pratt & Cady Co., Inc.

House Numbers.
Niagara Falls Metal Stamp Wks.
Thompson-Fleming, Inc.
Union Iron Products Co.

Hydrants.
Clark Co., H. W.
Clow & Sons, James B.
Columbian Iron Works.
Eddy Valve Co.
Flower Valve Mfg. Co.
Kennedy Valve Mfg. Co.
Ludlow Valve Mfg. Co.
Norwood Engineering Co.
Rensselaer Valve Co.
S. E. T. Valve & Hydrant Co.
Smith Mfg. Co., A. P.
Wood & Co., R. D.

Indicator Posts.
Clow & Sons, James B.
Columbian Iron Works.
Flower Valve Mfg. Co.
Kennedy Valve Mfg. Co.
Ludlow Valve Mfg. Co.
Pratt & Cady Co., Inc.
Rensselaer Valve Co.

Insulating Materials.
Barrett Co.
Bissell Co., F.
Carey Co., Philip.
General Electric Co.
Westinghouse Electric & Mfg. Co

Insulated Wire and Cable.
General Electric Co.
Habirshaw Electric Cable Co.
Hazard Mfg. Co.
Simplex Wire & Cable Co.

Jail Cells and Jail Work.
Barnum Iron Works, E. T.
Stewart Iron Works Co.

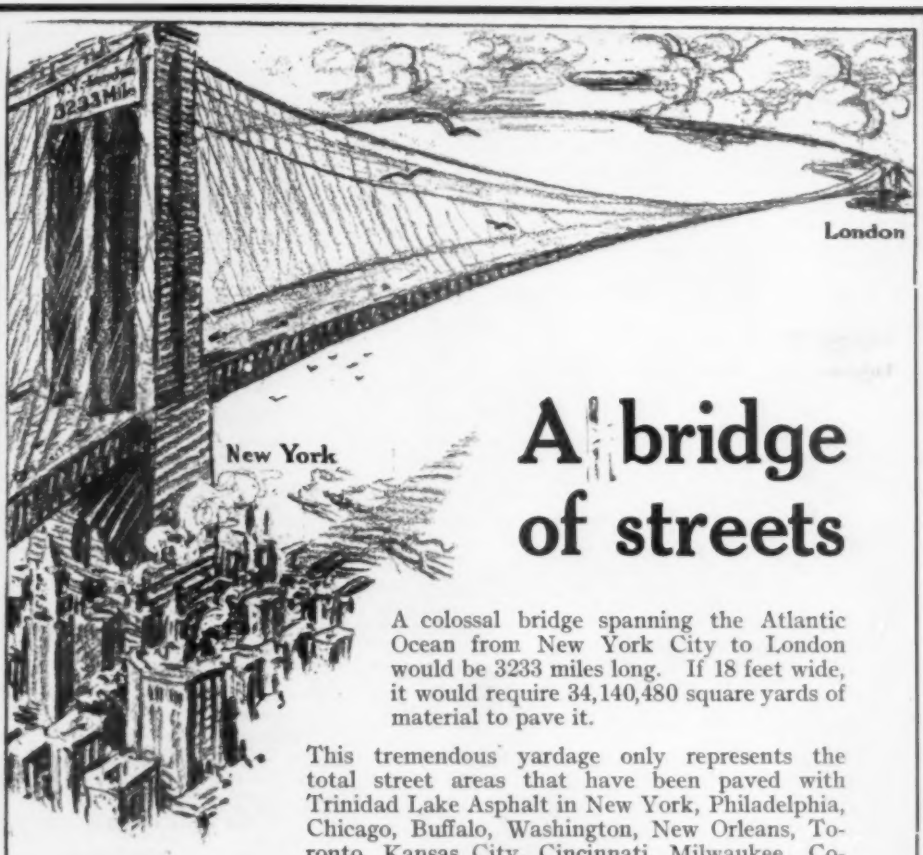
Joints, Flexible.
Coldwell-Wilcox Co.

Kahn Armour Plates.
Truscon Steel Co.

Kettles, Tar and Asphalt.
Connery & Co., Inc.
Good Roads Machinery Co.
Tarrant Mfg. Co.

Landscape Architects.
See page 121.

Continued on page 14



A bridge of streets

A colossal bridge spanning the Atlantic Ocean from New York City to London would be 3233 miles long. If 18 feet wide, it would require 34,140,480 square yards of material to pave it.

This tremendous yardage only represents the total street areas that have been paved with Trinidad Lake Asphalt in New York, Philadelphia, Chicago, Buffalo, Washington, New Orleans, Toronto, Kansas City, Cincinnati, Milwaukee, Columbus and Harrisburg.

TRINIDAD LAKE ASPHALT

"Nature-Made and Nature-Tested"

is being used in vastly increasing amounts throughout the world. **It has been proved** that it will withstand the ravages of traffic and the elements longer and at **less maintenance cost** than any other bituminous material known. It is a native lake asphalt, seasoned for centuries.

Write for "THE ASPHALT TIME TABLE"

The Barber Asphalt Paving Company
PHILADELPHIA

No. 2
Trinidad Records
That No Other Bituminous Paving Material Can Equal

Buffalo, New York
Bryant street paved with Trinidad Lake Asphalt in 1881. Now 39 years old and still in perfect condition. Maintenance cost only $0.03 per yard per year

Every name in this list is represented by an advertisement in this issue of THE AMERICAN CITY. The alphabetical index to all advertisements follows this classified list. See page 146

Lavatory Specialties.
Imperal Brass Mfg. Co.

Lawn Mowers.
Austin Western Road Machy. Co.
Coldwell Lawn Mower Co.
Pennsylvania Lawn Mower Works
Shawnee Mower Co.

Lawn Sweepers.
Everwear Mfg. Co.
Pennsylvania Lawn Mower Co.

Lead Furnaces & Caulking Tools.
Smith Mfg. Co., A. P.

Leadite.
Leadite Co.

Lead Wool.
United Lead Co.

Leak Finders.
Clark & Co., H. W.
Pitometer Co.

License Plates and Tags.
Niagara Falls Metal Stamp Wks.

Lighting Standards.
American Concrete Products Co.
Clow & Sons, James B.
Cutter Works, George.
Electric Railway Equipment Co.
King Mfg. Co.
Stewart Iron Works Co.

Liquid Chlorine.
Electro Bleaching Gas Co.
Hooker Electrochemical Co.
Mathieson Alkali Works, Inc.
Pennsylvania Salt Mfg. Co.
Wallace & Tiernan Co., Inc.

Loaders and Unloaders.
Haiss Wagon Loader Co.

Lockers, Steel
Medart Mfg. Co., Fred

Lubricants.
Dixon Crucible Co., Joseph.

Manhole Covers.
Barnum Iron Works, E. T.
Clark Co., H. W.
Clow & Sons, James B.
Columbian Iron Works.
Madison Foundry Co.
S. E. T. Valve & Hydrant Co.
U. S. Cast Iron Pipe & Foundry Co
Wood & Co., R. D.

Merry-Go-Rounds.
American Playground Device Co.
Everwear Mfg. Co.
George, Howard.
Hill-Standard Co.
Medart Mfg. Co., Fred

Metal Forms.
Northwestern Steel and Iron Works.

Metal Preservatives.
Dixon Crucible Co., Joseph.

Meter Books.
Buffalo Meter Co.
Mueller Mfg. Co., H.
Pittsburgh Meter Co.

Meter Boxes.
Clark Co., H. W.
Clow & Sons, James B.
Columbian Iron Works.
Ford Meter Box Co.
McNutt Meter Box Co.
S. E. T. Valve & Hydrant Co.

Meter Couplings.
Clark Co., H. W.
Ford Meter Box Co.
McNutt Meter Box Co.
Mueller Mfg. Co., H.

Meter Holding Devices.
Ford Meter Box Co.
McNutt Meter Box Co.

Meter Testers.
Buffalo Meter Co.
Clark Co., H. W.
Ford Meter Box Co.
Mueller Mfg. Co., H.
National Meter Co.
Neptune Meter Co.
Pittsburgh Meter Co.

Meters—See Water and Gas Meters.

Meters, Air, Brine, Etc.
Builders Iron Foundry

Meters for Oil and Gasoline.
Builders Iron Foundry
National Meter Co.
Neptune Meter Co.
Pittsburgh Meter Co.

Motor Trucks.
Autocar Co., The
Federal Motor Truck Co.
International Motor Co.
Packard Motor Car Co.
Selden Truck Corp.
Service Motor Truck Co.
Tiffin Wagon Co.
White Co., The.

Motor Fire Apparatus—See Automobile Fire Apparatus.

Natural Asphalt.
Barber Asphalt Paving Co.

Nurseries. See Page 116.

Oil Engines.
Busch-Sulzer Bros-Diesel Eng. Co.
Fairbanks, Morse & Co.
Indiana Air Pump Co.
Nordberg Manufacturing Co.
Pittsburgh Filter & Engineering Co.

Oil Tanks.
See Tanks, Storage for Oils and Gasoline, etc.

Ornamental Metal Fencing.
Barnum Iron Works, E. T.

Packing.
Carey Co., Philip.

Paint, Preservative.
Barrett Co.
Dixon Crucible Co., Joseph.
Du Pont de Nemours & Co., E. I.

Paint Gun (Pneumatic).
Spray Engineering Co.

Park Benches.
American Playground Device Co.
Barnum Iron Works, E. T.
Stewart Iron Works Co.

Park and Lawn Sprinklers.
Buckner, W. A.
Spray Engineering Co.

Paving Machinery and Tools.
Barber Asphalt Paving Co.
Erie Machine Shops
Equitable Asphalt Maintenance Co.
Good Roads Machinery Co.
Warren Bros. Co.

Paving Materials. (See also under Brick and Cement.)
Barber Asphalt Paving Co.
Barrett Co.
Bitoslag Paving Co.
Carey Co., Philip.
Standard Oil Co. of Indiana.
Texas Company
Warren Bros. Co.

Paving Mixers
Barber Asphalt Paving Co.
Texas Company
Warren Bros. Co.
Worthington Pump & Machy.Corp

Paving Mixtures.
Barber Asphalt Paving Co.
Standard Oil Co. of Indiana.

Pencils, Drafting, Office.
Dixon Crucible Co., Joseph.

Continued on page 142

Pipe.
American Cast Iron Pipe Co.
Cast Iron Pipe Pub. Bureau, R. C. McWane, Sec.
Central Foundry Co.
Clow & Sons, James B.
East Jersey Pipe Co.
Lynchburg Foundry Co.
U. S. Cast Iron Pipe & Foundry Co.
Warren Fdry. & Machine Co.
Wood & Co., R. D.
Zelnicker Supply Co., Walter A.

Pipe Bending Machines.
American Pipe Bending Mach. Co.

Pipe Bends & Fittings.
Crane Co.

Pipe Covering.
Carey & Co., Philip.
Pacific Tank and Pipe Co.

Pipe Cutters.
Smith Mfg. Co., A. P.

Pipe Handling Machinery.
Taylor Portable Steel Derrick Co.

Pipe Joint Compound.
Dixon Crucible Co., Joseph.
Pacific Flush Tank Co.

Pipe Jointing Materials.
Leadite Co.
United Lead Co.

Pipe Locators.
Clark Co., H. W.

Pipe (Riveted Steel.)
Pittsburgh-Des Moines Steel Co.

Pitch.
Barrett Co.
Carey Co., Philip.

Pitometers.
Pitometer Co., The.

Pito Tubes.
Simplex Valve & Meter Co.

Playground Apparatus.
American Playground Device Co.
American-La France Fire Eng. Co.
Everwear Mfg. Co.
George, Howard.
Hill-Standard Co.
Medart Mfg. Co., Fred

Plows.
Austin Western Road Mach'y Co.
Burch Plow Works Co.
Good Roads Machinery Co.

Plumbing Supplies.
Clow & Sons, James B.
Imperal Brass Mfg. Co.
Mueller Mfg. Co., H.
Rundle Spence Mfg. Co.

Poles, Combination Railway and Lighting.
Cutter Works, George.
Electric Railway Equipment Co.
United Iron Works, Inc.

Police Patrols.
The Autocar Co.
White Co., The.

Police Signal Cables.
Habirshaw Electric Cable Co.
Hazard Mfg. Co.
Simplex Wire & Cable Co.

Police Signal Systems.
Gamewell Fire Alarm Telegraph Co.

Portable Steel Derricks.
Taylor Portable Steel Derrick Co.

Portland Cement.
Alpha Portland Cement Co.
Pennsylvania Cement Co.
Portland Cement Assn.

Powders.
Du Pont de Nemours & Co., E. I.

Pressure Regulator for Water, Steam, Air and Oil.
Mueller Mfg. Co., H.

Producers, Gas Power Plant.
Westinghouse Electric & Mfg. Co.

METROPOLITAN

It is natural to look for high quality and liberal and truly helpful service where the greatest facilities exist.

In the paving brick field that means: "Look to METROPOLITAN, the Largest Maker of Paving Brick in the World."

Here you will not look in vain. The operation of seven modern brick plants, and a staff composed from top to bottom of highly experienced brick men is surely a guaranty that we *can* serve; and our record plus the reputation of "*Bessemer*" and "*Metropolitan*" brand paving brick is a guaranty that we *will* serve. May we serve *you?*

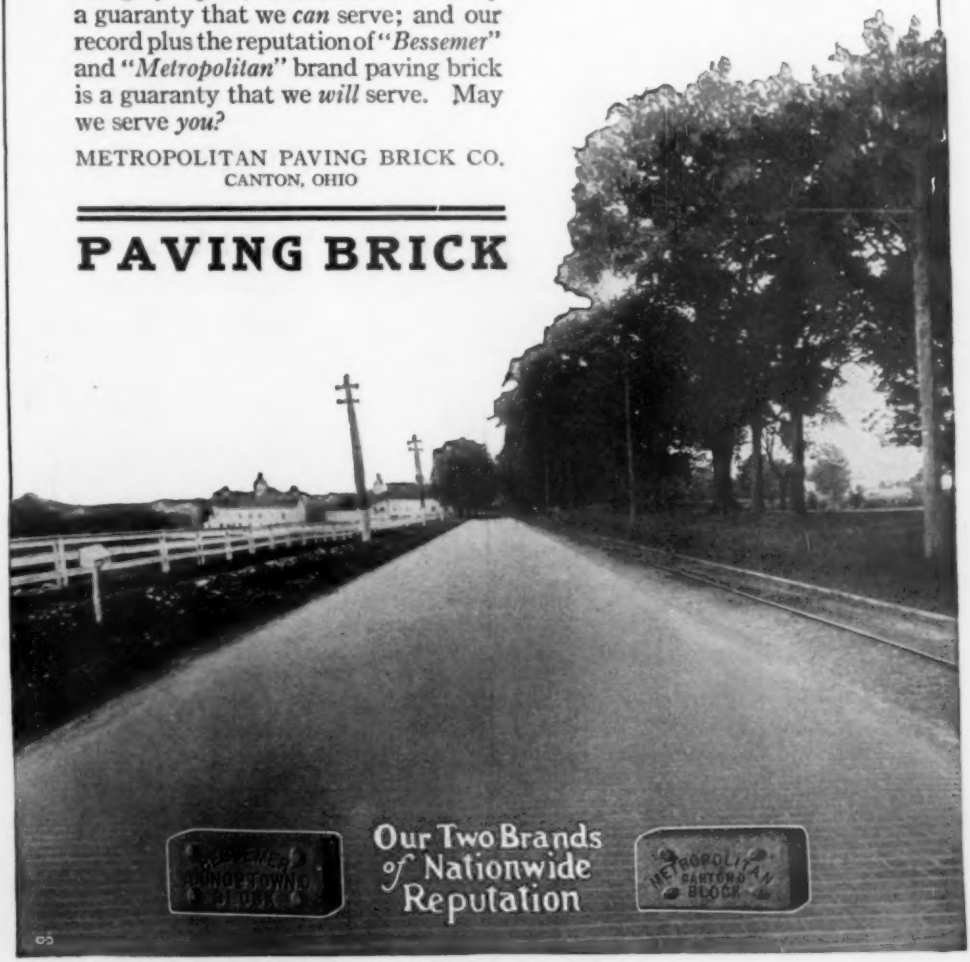
METROPOLITAN PAVING BRICK CO.
CANTON, OHIO

LARGEST MAKERS OF PAVING BRICK IN THE WORLD.

TAXPAYERS' VALUE
BRICK ROADS

MEMBER NATIONAL PAVING BRICK MFRS. ASSOCIATION

PAVING BRICK



Every name in this list is represented by an advertisement in this issue of THE AMERICAN CITY. The alphabetical index to all advertisements follows this classified list. See page 146

Pumping Machinery.
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
Deming Co.
Fairbanks, Morse & Co.
Nordberg Manufacturing Co
Northern Fire Apparatus Co.
United Iron Works, Inc.
Waldo Bros. & Bond Co.
Wood & Co., R. D.
Worthington Pump and Mach. Corp.
Yeoman Bros.

Pumps for Oil and Gasoline
Bowser & Co., Inc., S. F.

Ramshorn Meter Holding Frame.
Ford Meter Box Co.

Reinforcing for Paving.
American Steel & Wire Co.
Truscon Steel Co.

Repair Lids for Service Boxes.
Clark Co., H. W.
Mueller Mfg. Co., H.

Road and Street Machinery.
Austin-Western Road Machy. Co.
Baker Mfg. Co.
Barber Asphalt Paving Co.
Connery & Co., Inc.
Good Roads Machinery Co.
Haiss Wagon Loader Co.
Littleford Bros.
International Motor Co.
Lyle Culvert & Road Equip. Co.
Kinney Mfg. Co.
Packard Motor Car Co.
Russell Grader Mfg. Co.
Tarrant Mfg. Co.
Union Iron Products Co.
Universal Road Machy. Co.
Warren Bros. Co.
Zelnicker Supply Co., Walter A.
Zieg Mfg. Co., F. B.

Road Binders.
Barber Asphalt Paving Co.
Barrett Co.
Semet-Solvay Co.
Standard Oil Co. of Indiana.
Texas Co.

Road Culverts.
Burch Plow Works Co.
Clow & Sons, James B.
Good Roads Machy. Co.
Lyle Culvert & Road Equipt. Co.
Newport Culvert Co.
Storms Mfg. Co.
Union Iron Products Co.
U. S. Cast Iron Pipe & Fdry. Co.
Wood & Co., R. D.
Zieg Mfg. Co., F. B.

Road Drag and Street Scrapers.
Austin-Western Road Machy. Co.
Baker Mfg. Co.
Good Roads Machinery Co
Lyle Culvert & Road Equip. Co.
Newport Culvert Co.
Rochester Can Co.
Union Iron Products Co.
Zieg Mfg. Co., F. B.

oad Fabric.
American Steel & Wire Co.

Road Oil.
Barber Asphalt Paving Co.
Barrett Co., The
Dustoline for Roads Co.
Standard Oil Co. of Indiana.
Texas Company

Road Oilers.
The Autocar Co.
Austin-Western Road Machy. Co.
Good Roads Machinery Co.
Kinney Mfg. Co.
Service Motor Truck Co.
Universal Road Machy. Co.
White Co., The.

Road Rollers.
Austin-Western Road Machy. Co.
Barber Asphalt Paving Co.
Buffalo Springfield Roller Co.
Erie Machine Shops.
Good Roads Machinery Co.

Rock Crushers.
Austin-Western Road Machy.Co.
Good Roads Machinery Co.
Universal Road Machy. Co.
Worthington Pump & Mach. Corp

Roofing Materials.
Barber Asphalt Paving Co.
Barrett Co., The
Carey Co., Philip.

Rubber Tires.—See Tires, Rubber.

Rubbish Burners.
Barnum Iron Works, E. T.

Rust Preventing Material.
Barrett Co., The
Dixon Crucible Co., Jos.

Sand Spreaders.
Thompson-Fleming, Inc.

Sand Testing Machines.
Kolesch & Co.

Sanitary Carts.
Tiffin Wagon Co.

Sanitary Drinking Fountains.
Barnum Iron Works, E. T.
Clow & Sons, James B.
Crane Co.
Imperal Brass Mfg. Co.
Mueller Mfg. Co., H.
Murdock Mfg. & Supply Co.
Puro Sanitary Fountain Co.
Rundle-Spence Mfg. Co.
Stewart Iron Works Co.

Scales.
Fairbanks, Morse & Co.

Scarifiers.
Austin-Western Road Machy. Co.
Buffalo Springfield Roller Co.
Good Roads Machinery Co.
Lyle Culvert & Road Equip. Co.
Universal Road Machy. Co.

Seeds, Plants and Bulbs.
Burpee Co., W. Atlee.
Dreer, Henry A.
Storrs & Harrison Co.

Service Boxes.
Builders Iron Foundry
Clark Co., H. W.
Clow & Sons, James B.
Mueller Mfg. Co., H.

Service Box Finders.
Clark Co., H. W.

Sewage Disinfection.
Electro Bleaching Gas Co.
Wallace & Tiernan Co., Inc.

Sewage Disposal.
Dorr Co., The.

Sewage Meters
Builders Iron Foundry

Sewage Pumps and Ejectors.
Otterson Auto-Eductor Co.
Pacific Flush Tank Co.
Yeomans Bros. Co.

Sewage Sterilization.
Electro Bleaching Gas Co.
Wallace & Tiernan Co., Inc.

Sewer Buckets.
Champion Potato Machinery Co.
Healey, P. J.

Sewer Castings.
Clark Co., H. W.
Clow & Sons, James B.
Dee Co., Wm. E.
Madison Foundry Co.
Pacific Flush Tank Co.

Sewer Cleaning Apparatus.
Champion Potato Machinery Co.
Healey, P. J.
Pacific Flush Tank Co.
Thompson-Fleming, Inc.
Turbine Sewer Machine Co.

Sewer Pipe.
Dee Co., Wm. E
Pacific Tank and Pipe Co.

Sewer Rods.
Bissell Co., F.
Champion Potato Machinery Co.
Turbine Sewer Machine Co.
Waldo Bros. & Bond Co.

Sewer Screens.
Pacific Flush-Tank Co.

Shades.
Oswego Shade Cloth Co.
Stewart Hartshorn Co.

Sheer Gates.
Coldwell-Wilcox Co.
Columbian Iron Works.
Kennedy Valve Mfg. Co.
Rensselaer Valve Co.

Shower Baths.
Imperal Brass Mfg. Co.

Signs—Iron and Wire.
Barnum Iron Works, E. T.
Lyle Culvert & Road Equip. Co.
N. Y. Enamel Steel Sign Co.
Stewart Iron Works Co.
Thompson-Fleming, Inc.
Union Iron Products Co.

Sleeves and Valves.
Flower Valve Mfg. Co.
Kennedy Valve Mfg. Co.
Mueller Mfg. Co., H.
Rensselaer Valve Co.

Sluice Gates and Valves.
Coldwell-Wilcox Co.
Columbian Iron Works.
Eddy Valve Co.
Flower Valve Mfg. Co.
Kennedy Valve Mfg. Co.
Ludlow Valve Co.
Rensselaer Valve Co.

Smoke Stacks.
Pittsburgh-Des Moines Steel Co.

Snow Cleaning Machinery.
Baker Mfg. Co.
Good Roads Machinery Co.
Russell Grader Mfg. Co.
Zieg Mfg. Co., F. B.

Soil Pipe (Cast Iron).
Central Foundry Co.
Clow & Sons, James B.

Spraying Machinery for Trees and Shrubs.
Deming Co.
Fairbanks, Morse & Co.

Spray Nozzles.
Spray Engineering Co.

Sprinklers, Automatic.
Grinnell Co.

Standpipes.
Chicago Bridge and Iron Works.
Connery & Co., Inc.
Fairbanks, Morse & Co.
Pacific Tank and Pipe Co.
Pittsburgh-Des Moines Steel Co.
United Iron Works, Inc.
Wood & Co., R. D.

Steam Traps and Separators.
Crane Co.

Steel Plate Work.
Pittsburgh-Des Moines Steel Co.

Steel Swings and Settees
Bausman Mfg. Co.

Stone Spreaders.
Austin Western Road Mach'y Co.
Burch Plow Works Co.

Street Flushers.
International Motor Co.
Kinney Mfg. Co.
Municipal Supply Co.
Service Motor Truck Co.
Thompson-Fleming, Inc.
Tiffin Wagon Co.
White Co., The.

Continued on page 144

TAXPAYERS' VALUE
BRICK ROADS
Good Night!
End of the brick road! That sinking feeling! Uncomfortable driving! Impossible hauling!
But of course your town lies *the other* way, and you see just the beginning of the "Taxpayers' Value" BRICK ROAD, the road of least cost per year of service. Even though ten years old this is only the *beginning* of the BRICK ROAD—for, properly constructed, it is good for decades more.
ROAD SIGNS. We are also prepared to furnish free, Detour, Street Closed, Road Closed signs, strong and serviceable. Write to nearest office for your supply, and for "Dependable Highways," the pavement classic.
NATIONAL PAVING BRICK MFRS. ASSOCIATION
800 ENGINEERS BUILDING, CLEVELAND, OHIO
Members:
Eastern Paving Brick Manufacturers Assn. 612 Lincoln Bldg., Philadelphia, Pa
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Each member of the National Paving Brick Manufacturers' Association guarantees his product against defects in material and manufacture. Each brick in street or highway surface gives assurance of long and worthy service because each brick is a guaranteed service unit, complete and finished *before it is laid.*
or GOOD MORNING
Which way is your town moving?

Every name in this list is represented by an advertisement in this issue of THE AMERICAN CITY. The alphabetical index to all advertisements follows this classified list. See page 146

Street Lamps—Electric.
Cutter Works, George.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Street Lamp Posts.
Barnum Iron Works, E. T.
Clow & Sons, James B.
Cutter Works, George.
Electric Railway Equipment Co.
King Mfg. Co.
Lyle Culvert & Road Equip. Co.
Stewart Iron Works Co.
Union Iron Products Co.
United Iron Works, Inc.

Street and Road Graders.
Austin-Western Road Machy. Co.
Good Roads Machinery Co.
Niagara Falls Metal Stamp Wks.
Russell Grader Mfg. Co.
Union Iron Products Co.
Zieg Mfg. Co., F. B.

Street and Road Signs.
Lyle Culvert & Road Equip. Co.
N. Y. Enamel Steel Sign Co.
Thompson-Fleming, Inc.
Union Iron Products Co.

Street Sign Posts.
Cutter Works, George.
Lyle Culvert & Road Equip. Co.
Union Iron Products Co.

Street Sprinklers.
Austin-Western Road Machy. Co.
Autocar Co., The
Federal Motor Truck Co.
International Motor Co.
Service Motor Truck Co.
Thompson-Fleming, Inc.
Tiffin Wagon Co.
White Co., The.

Street Sweepers.
Austin-Western Road Machy. Co.
Elgin Sales Co.
Good Roads Machinery Co.

Street Trash Cans.
Rochester Can Co.
Safety Sanitary Rubbish Box Co.
Steel Basket Co.
Tarrant Mfg. Co.

Surveyors Instruments.
Kolesch & Co.
Weber & Co., F.

Tanglefoot for Trees.
O. & W. Thum Co.

Tanks, Storage for Oils, etc.
Bowser & Co., Inc., S. F.
Chicago Bridge and Iron Works.
Connery & Co., Inc.
Pacific Tank and Pipe Co.
Pittsburgh-Des Moines Steel Co.
United Iron Works, Inc.

Tanks and Towers.
Chicago Bridge and Iron Works.
Pacific Tank and Pipe Co.
Pittsburgh-Des Moines Steel Co.
United Iron Works, Inc.
Wood & Co., R. D.
Zeluicker Supply Co., Walter A.

Tapping Machines.
Mueller Mfg. Co. H.
Smith Mfg. Co., A. P.

Tar and Asphalt Spreaders.
Tarrant Mfg. Co.
White Co., The.

Tar and Tarvia.
Barrett Co.

Tar Kettles.
Barber Asphalt Paving Co.
Connery & Co., Inc.
Good Road Machinery Co.
Littleford Bros.
Tarrant Mfg. Co.
Warren Bros. Co.

Tires, Rubber.
Dayton Rubber Mfg. Co.
Firestone Tire & Rubber Co.
Kelly-Springfield Tire Co.
U. S. Tire Co.

Traction Engines.
Buffalo Springfield Roller Co.

Tractors.
American-La France Fire Engine Co.
Fairbanks, Morse & Co.
Federal Motor Truck Co.
Service Motor Truck Co.
White Co., The.

Traffic Posts.
Cutter Works, George.
Lyle Culvert & Road Equip. Co.
Thompson-Fleming, Inc.
Union Iron Products Co.

Traffic Regulation Signs.
Lyle Culvert & Road Equip. Co.
N. Y. Enamel Steel Sign Co.
Thompson-Fleming, Inc.
Union Iron Products Co.

Trailers.
Buffalo Springfield Roller Co.

Trench Braces.
Clow & Sons, James B.
Waldo Bros. & Bond Co.

Trenching Machinery.
Pawling & Harnischfeger Co.

Trench Pumps.
Deming Co.
Fairbanks, Morse & Co.
Northern Fire Apparatus Co.
Pawling & Harnischfeger Co.
Waldo Bros. & Bond Co.
Worthington Pump & Mach. Co.

Truscon Armour Plates.
Truscon Steel Co.

Turbines.
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
Westinghouse Electric & Mfg. Co.

Typewriters.
Noiseless Typewriter Co.

Vacuum Cleaners.
Kent Vacuum Cleaner Co.

Vacuum Pumps.
Deming Co.
Worthington Pump & Mach. Corp.

Valves.
Clark Co., H. W.
Clow & Sons, James B.
Coldwell-Wilcox Co.
Crane Co.
Eddy Valve Co.
Flower Valve Mfg. Co.
Grinnell Co.
Kennedy Valve Mfg. Co.
Ludlow Valve Co.
Mueller Mfg. Co., H.
Pratt & Cady Co., Inc.
Rensselaer Valve Co.
S. R. T. Valve & Hydrant Co.
Simplex Valve and Meter Co.
Smith Mfg. Co., A. P.
Wood & Co., R. D.

Valves, Air.
Grinnell Co.
Kennedy Valve Mfg. Co.
Pratt & Cady Co., Inc.
Simplex Valve and Meter Co.

Valve Boxes and Housings.
Clark Co., H. W.
Columbian Iron Works.
Clow, James B. & Sons.
Eddy Valve Co.
Flower Valve Mfg. Co.
Kennedy Valve Mfg. Co.
Ludlow Valve Co.
Mueller Manufacturing Co., H.
Pratt & Cady Co., Inc.
Rensselaer Valve Co.
S. R. T. Valve & Hydrant Co.
Smith Mfg. Co., A. P
U. S. Cast Iron Pipe & Foundry Co.
Wood & Co., R. D.

Valve Inserting Machinery.
Smith Mfg. Co., A. P.

Valve Seats.
Pratt & Cady Co., Inc.
Wood & Co., R. D.

Valve Specialties
Crane Co.
Pratt & Cady Co., Inc.
S. R. T. Valve & Hydrant Co.

Venturi Meters
Builders Iron Foundry

Wagon Loaders.
Haiss Wagon Loader Co.
Tarrant Mfg. Co.

Water Supply Conservation.
National Water Main Cleaning Co.
Pitometer Co.

Water Main Cleaning.
National Water Main Cleaning Co.

Water Meters.
Badger Meter Mfg. Co.
Buffalo Meter Co.
Gamon Meter Co.
Hersey Mfg. Co.
National Meter Co.
Neptune Meter Co.
Pittsburgh Meter Co.
Simplex Valve and Meter Co.
Thomson Meter Co.
Union Water Meter Co.
Worthington Pump & Mach. Corp

Water Meters (Special)
Builders Iron Foundry
General Electric Co.

Waterproofing.
Barber Asphalt Paving Co.
Barrett Co.
Carey Co., Philip.
Texas Company
Truscon Steel Co.

Water Purification
Dorr Co., The.
Electro Bleaching Gas Co.
R. U. V. Company
Wallace & Tiernan Co. Inc.

Water Purification Chemicals.
See Chemicals for Water Purification.

Water Regulators.
Mueller Mfg. Co. H.
Builders Iron Foundry
Pacific Flush Tank Co.
Simplex Valve and Meter Co.
Union Water Meter Co.

Water Sterilization.
Electro Bleaching Gas Co.
Wallace & Tiernan Co., Inc.

Water Systems.
Fairbanks, Morse & Co.

Water Towers.
Chicago Bridge and Iron Works.
Pittsburgh-Des Moines Steel Co.
United Iron Works, Inc.

Well Construction & Equipment
Clark Co., H. W.

Well Strainer.
Cook, A. D.

Wheel Scrapers.
Austin-Western Road Machy. Co.
Good Roads Machinery Co.
Lyle Culvert & Road Equip. Co.

Windmills.
Fairbanks, Morse & Co.

Wire and Cable.
General Electric Co.
Habirshaw Electric Cable Co.
Hazard Mfg. Co.
Simplex Wire & Cable Co.

Wire-Cut-Lug Brick.
Metropolitan Paving Brick Co.
Southern Clay Mfg. Co.

Wood Preservatives.
Barrett Co.
Republic Creosoting Co.

Wood Paving.
Republic Creosoting Co

Wood Pipe.
American Wood Pipe Co.
Continental Pipe Mfg. Co.
Pacific Tank & Pipe Co.
Redwood Mfg. Co.
Western Wood Pipe Publicity Bureau.

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PATENTED

THE horse mower made for the "big jobs." The most economical and efficient means of cutting large areas of grass. It has a cutting width of 86 inches.

On golf courses, widespread lawns of public parks and cemeteries, it rides hills and hollows with ease, cutting cleanly and uniformly. The "PENNSYLVANIA TRIO" upholds every tradition of the famous "PENNSYLVANIA" *Quality* Line of Lawn Mowers, known for years as the most efficient, longest-lived and easiest-running mowers made.

Send for full information and price.

PENNSYLVANIA LAWN MOWER WORKS
JOHN [illegible] SONS
FOUNDED 1877 PHILADELPHIA

This trade mark is on the handles of:

"Pennsylvania"
Pennsylvania, Jr.
Pennsylvania Golf
Pennsylvania Putting Greens Mower
Continental
Great American B. B.
Shook Absorber
Quaker City
Red Cloud B. B.
Orchid B. B.
Daisy
New Belmont
Bellevue
Panama
Delta B. B.
Electra
Pennsylvania Pony
Pennsylvania Horse
Pennsylvania Grand Horse
Pennsylvania Trio Horse (86 in. cut)

INDEX TO ADVERTISEMENTS IN THIS ISSUE

Advertising pages are numbered at the bottom.

Advertisers whose announcements appear in alternate issues or irregularly throughout the year are indexed only in the numbers in which their advertisements are published.

Allis-Chalmers Mfg. Co..... 53
Alpha Portland Cement Co..... 101
American Cast Iron Pipe Co.... 36
American City Bureau..... 84A
American Concrete Products Co. 82
Amer.-La France Fire Eng. Co..60-61
American Nurseries..... 128
American Playground Device Co. 65
Amer. Pipe Bending Mach. Co... 48
American Steel & Wire Co..... 104
American Tel & Tel. Co..... 119
American Wood Pipe Co..... 50
Andorra Nurseries 127
Austin-Western Road Mach'y Co. 115
Autocar Company..... 5

Badger Meter Mfg. Co.....10-11
Baker Mfg. Co..... 100
Ballard & Co., F. W..... 135
Barber Asphalt Paving Co..... 139
Barnum Iron Works, E. T..... 82
Barrett Co., The..... 72
Bausman Mfg. Co..... 64
Bi-Lateral Fire Hose Co..... 92
Bissell & Co., F..... 28
Bitoslag Paving Co..... 107
Bobbink & Atkins..... 128
Bowser & Co., S. F..... 77
Buckner, W. A..... 120
Buffalo Meter Co..... 28
Buffalo-Springfield Roller Co... 112
Builders Iron Foundry..... 35
Burch Plow Works Co..... 96
Burpee Co., W. Atlee..... 127
Busch-Sulzer Bros.-Diesel Eng. Co 54

Camden Iron Works..... 34
Carey Co., Philip..... 105
Cast Iron Pipe Pub. Bureau....12-13
Central Foundry Co..... 49
Champion Corp..... 46
Chicago Bridge & Iron Works... 98
Childs Co., O. J..... 97
Clark Co., H. W..... 25
Clow & Son, James B..... 99
Coldwell Lawn Mower Co 94
Coldwell-Wilcox Co..... 28
Columbian Iron Works Co..... 36
Columbian Steel Tank Co..... 75
Connery & Co., Inc..... 110
Conard & Buzby..... 131
Continental Pipe Mfg. Co..... 90
Cook, A. D..... 44
Crane Co..... 39
Cutter Works, Geo..... 147

Davey Tree Expert Co..... 129
Dayton Rubber Mfg. Co..... 94
Dee Co., Wm. E..... 36
De Laval Steam Turbine Co.... 45
Deming Co., The..... 44
Destructor Co., The..... 134
Dixon Crucible Co., Joseph..... 92
Donaldson Co. (Willadean Nurs.) 128
Dorr Co., The..... 46
Dreer, Henry A..... 128
Du Pont de Nemours & Co.,E..20-121
Dustoline for Roads Co..... 65

East Jersey Pipe Co..... 48
Economy Drawing Table Co.... 126
Eddy Valve Co..... 37
Educational Exhibition Co..... 92
Electric Ry. Equip. Co..... 81
Electro Bleaching Gas Co..... 19
Elgin Sales Corp..... 106
Elm City Nursery Co..... 128
Engineering News-Record..... 66
Equitable Asphalt Main Co..... 106
Erie Machine Shops..... 112
Everwear Mfg. Co.....58-59

Fabric Fire Hose Co..... 94
Fairbanks, Morse & Co..... 55

Federal Motor Truck Co..... 88
Firestone Tire & Rubber Co 93
Flower Valve Mfg. Co..... 7
Ford Meter Box Co..... 30
Framingham Nursery Co..... 128

Gamewell Fire Alarm T. Co.... 116
Gamon Meter Co..... 22
General Electric Co..... 117
George, Howard..... 64
Good Roads Machinery Co..... 111
Grether Fire Equipment Co..... 96
Grinnell Co..... 73

Habirshaw Electric Cable Co., Inc 118
Haiss Mfg. Co., Geo..... 112
Hardy & Co., F. A..... 120
Haselbarth Bros..... 129
Hazard Mfg. Co..... 120
Healey, P. J..... 36
Hersey Manufacturing Co..... 78
Hill-Standard Co..... 62
Hollow Building Tile Assn..... 103
Hooker Electrochemical Co..... 21

Imperial Brass Mfg. Co..... 122
Indiana Air Pump Co..... 64
International Motor Co..... 87

Jaeger Machine Co..... 96

Kelly-Springfield Tire Co..... 95
Kennedy Valve Mfg. Co..... 32
Kent Vacuum Cleaner Co..... 135
King Mfg. Co..... 83
Kinney Mfg. Co..... 113
Knowles, Morris..... 133
Kohankie & Son, Henry..... 129
Kolesch & Co..... 129
Kuhlman Electric Co..... 83

Lea-Courtenay Co..... 47
Leadite Co., The..... 43
Lewis & Valentine..... 129
Littleford Bros..... 110
Ludlow Valve Mfg. Co..... 32
Lyle Culvert & Road Equip. Co. 124
Lynchburg Foundry Co..... 36

Madison Foundry Co..... 48
Marchant Calculating Mach. Co. 122
Mathieson Alkali Wks., Inc., The 2
McNutt Meter Box Co..... 24
Medart Mfg. Co., Fred..... 63
Meehan Co., Thos. B..... 127
Metropolitan Paving Brick Co.. 141
Monroe Calculating Machine Co. 79
Mueller Mfg. Co., H..... 71
Municipal Supply Co..... 55
Murdock Mfg. & Supply Co.... 82

National Meter Co..... 23
National Paving Brick Mfrs. Assn 143
National Water Main Clean'g Co.14-15
Neptune Meter Co..... 8-9
Newport Culvert Co..... 74
N.Y. Contin'l Jewell Filtration Co 42
N. Y. Enamel Steel Sign Co..... 124
Niagara Falls Metal Stamp. Wks. 124
Noiseless Typewriter Co..... 58
Nordberg Manufacturing Co.... 76
Northern Fire Apparatus Co.... 49
Northwestern Steel & Iron Works 106
Norwood Engineering Co..... 40

Otterson Auto-Eductor Co..... 70

Pacific Flush Tank Co..... 44
Pacific Tank & Pipe Co..... 52

Packard Motor Car Co..... 89
Pawling & Harnischfeger Co.... 84
Penn. Lawn Mower Works..... 145
Pennsylvania Cement Co..... 65
Pennsylvania Salt Mfg. Co..... 18
Pioneer Asphalt Co..... 100
Pitometer Co..... 31
Pittsburgh-Des Moines Steel Co. 137
Pittsburgh Filter & Eng. Co.... 41
Pittsburgh Meter Co..... 29
Pittsburgh Testing Laboratory.. 134
Portland Cement Assn..... 102
Pratt & Cady Co., Inc..... 34
Prospect Mfg. Co..... 97
Puro Sanitary Drinking Foun. Co. 122

Redwood Mfg. Co..... 10
Rensselaer Valve Co..... 36
Republic Creosoting Co..... 106
Rochester Can Co..... 125
Rundle-Spence Mfg. Co..... 123
Russell Grader Mfg. Co..... 114
R. U. V. Company, Inc..... 24

Safety Sanitary Rubbish Box Co. 124
San Remo Hotel..... 100
Scofield Engineering Co..... 133
Selden Truck Corp..... 91
Semet-Solvay Co..... 104
Service Motor Truck Co..... 148
S. E. T. Valve & Hydrant Co.... 48
Shawnee Mower Co..... 114
Simplex Valve & Meter Co..... 33
Simplex Wire & Cable Co..... 120
Smith Mfg. Co., A. P..... 32
Smith Co., W. & T..... 128
Southern Clay Mfg. Co..... 106
Spray Engineering Co..... 118
Springfield Engineering Co.....4 86
Standard Oil Co. of Indiana..... 108
Steel Basket Company..... 126
Stewart Hartshorn Co..... 64
Stewart Iron Works Co..... 104
Storms Mfg. Co..... 106
Storrs & Harrison Co..... 127

Tarrant Mfg. Co..... 124
Taylor Portable Steel Derricks Co 98
Texas Company..... 109
Thompson-Fleming, Inc..... 44
Thomson Meter Co..... 27
Thum Co., O. & W..... 135
Tiffin Wagon Co..... 90
Truscon Steel Co..... 108
Turbine Sewer Mch. Co..... 76

Union Iron Products Co..... 83
Union Water Meter Co..... 26
United Iron Works, Inc..... 34
United Lead Co..... 32
Universal Road Machinery Co.97-112
U. S. Cast Iron Pipe & Fdy. Co.. 3
United States Tire Co..... 92

Waldo Bros. & Bond Co..... 130
Wallace & Tiernan Co., Inc.....16-17
Warren Bros. Co..... 64
Warren Foundry & Machine Co. 98
Weber & Co., F..... 124
Wells, James P..... 50
Western Wood Pipe Pub. Bureau 50
Westinghouse Elec. & Mfg. Co... 147
White Co., The..... 58
Wiley & Sons, John..... 126
Wood & Co., R. D..... 38
Worthington Pump & Mch. Corp.51-57

Yeomans Brothers Co..... 46

Zelnicker Supply Co., Walter A.. 120
Zieg Mfg. Co., F. B..... 134
Zueblin, Charles..... 16

For Directory of Consulting Engineers, Landscape Architects, etc., see pages 131-132-133-134

For Classified List of Advertisers' Products see pages 136-138-140-142-144

Street Lighting —its relation to Public Safety

Wave of Chicago Thefts Laid to Lack of Lights

City Turns on Street Illumination After Series of Burglaries and Hold-Ups.

About 150 Arrests Are Made

CHICAGO, Nov. 25 (AP).—Among about 150 persons taken into custody in the past three days, in which hold-ups, automobile thefts and safe blowings followed in rapid succession, sixteen men and a woman are charged with implication in four murders, 100 saloon, pool room and street hold-ups and 150 house burglaries. Members of that band confessed to the more than 250 crimes, police asserted.

Reported robberies last night showed a falling off from the two previous nights. Street lights glowed despite the threatened coal shortage here after John J. Garrity, chief of police, said the orgy of thefts and attacks Saturday and Sunday nights was due at least in part to street illumination in some sections being cut off as a coal conservation measure.

Street Lighting in its origin and development was essentially a police measure. Its history goes back to mediaeval times, in which the streets were infested by thieves, murderers and highway men. Early in the fifteenth century, in Paris, lanterns were ordered to be placed at street corners and in householders' windows to co-operate with the night watch in promoting public safety. And so street lighting grew and developed. The subsequent 400 years have seen an immense change in methods and material, but the purpose of street lighting has remained the same, a measure of public safety and an adjunct to the police force.

Lighting today bears a closer relation to public safety than it did when the only occupants of the streets after nightfall were a few crawling carriages and belated pedestrians. It is necessary not only to light the streets well enough to mark their course and serve for the assistance of the police, but well enough to distinguish the way clearly, to avoid obstacles even when going at fairly high speed, to distinguish and recognize persons, and to tell where they are and what they are doing. The police should be able to note the actions of suspicious characters before they stumble over them, or to detect the number of a law-breaking automobile before it has vanished into the distance.

All these requirements of a complicated civilization demand lighting upon a vastly more liberal scale than sufficed for earlier days, or than is found in many municipalities even today.

Send us your address and we will show you how to obtain a modern street lighting system at small initial and maintenance cost.

GEORGE CUTTER CO.

413 Notre Dame Street **South Bend, Ind.**

TRUCKS THAT INCREASE CIVIC EFFICIENCY

Civic welfare depends on efficient transportation.

THE welfare of your community, its prosperity, health and safety standards are dependent largely on the ability of your transportation department to function in an efficient, dependable manner.

In every form of civic construction work, under all manner of conditions, carrying fire apparatus or public health equipment, SERVICE Motor Trucks have established by proven records of performance their ability to meet every municipal haulage requirement.

The following letter received under date of April 9, 1919, from W. S. Winnard, Supt. of Machinery for the Fire Department of Columbus, Ohio, tells an interesting story:

W. S. Winnard, of the Columbus, O., Fire Dept., wrote this letter.

> ***"The SERVICE Truck we bought in 1915 has been in constant use since the date of purchase with a cost of about $5.00 in repairs to date. We overhauled and repainted in January of this year and see no reason why this truck should not operate successfully for a number of years to come, as we found all bearings in excellent condition and showing little signs of wear."***

In analyzing your future needs for automotive equipment remember this—a motor truck should not be bought on first cost but on the basis of an investment.

SERVICE Motor Trucks will increase the efficiency of your city.

Past performance of SERVICE Motor Trucks should prove of great interest to you. There is an increasing tendency among cities to standardize on SERVICE equipment.

Equipped with dump and other specialized bodies, SERVICE Trucks are in use by Chicago, Indianapolis, Columbus, Kansas City and many other communities.

There is a SERVICE Motor Truck built to meet every municipal need.

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MOTOR TRUCKS

Builders of Business

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Distributors in all Principal Cities and Foreign Countries.